SKYWAYS

MILITARY ★ CIVIL ★ COMMERCIAL AVIATION

APRIL 1951 25¢

JET FIGHTER vs. Su

RUSH BY AIR
ONE DIVISION OF DOUGHFOOTS

ONLY A FLEET OF C-124s COULD AIRLIFT AN ENTIRE INFANTRY DIVISION AND ALL ITS EQUIPMENT

Quickly the giant Globemaster II brakes to a stop. Its clamshell doors fold back. Down comes the self-contained ramp. And seconds later battle-ready troops are pouring out of her monstrous belly. Nearby other C-124s unload such divisional equipment as M-24 tanks, 155 mm. Long Toms, bulldozers, trucks and scrapers.

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Designed to meet the vital need for aircraft to support global operations, the C-124 has been ordered in quantity by the armed forces. Already a certain number are in active service.

Over five years of careful planning and development work by Douglas and the military have made possible this revolutionary airplane. Such pioneering is typical of Douglas engineers, who are today turning their attention to advance-type combat planes with jet, rocket and turbo-prop propulsion. Douglas Aircraft Company, Inc.

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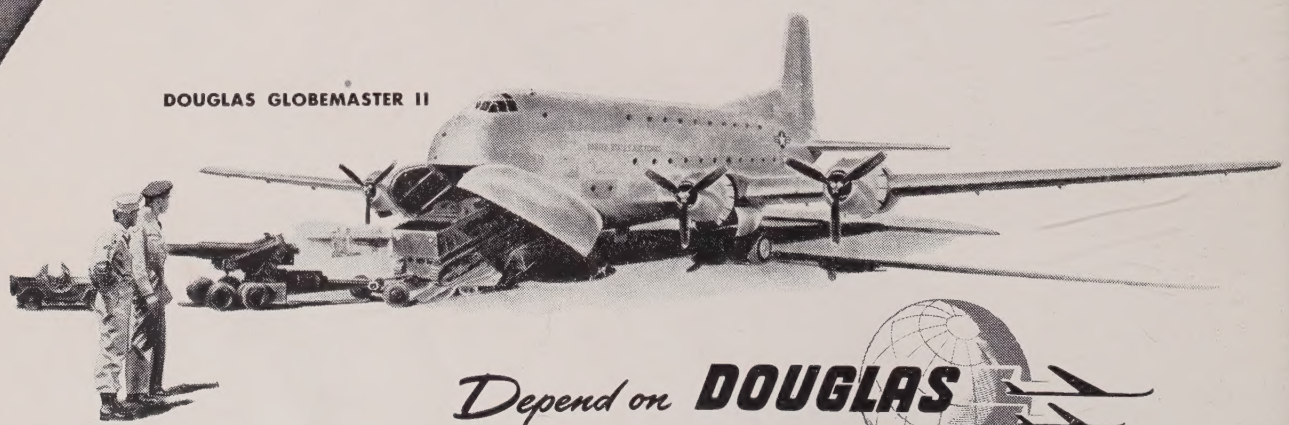

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At Newark Airport the Celanese DC-3 heads for the Esso Sign...

When the Celanese Corporation of America's DC-3 comes in to the Newark, N. J., Airport, the ship generally points in the direction of the winged Esso Oval at Newark Air Service, Inc. Chief Pilot Howard Zbornik and Pilot Clint Housel are accustomed to the expert service and high-quality Esso Aviation Products which have distinguished Newark Air Service for more than 20 years.

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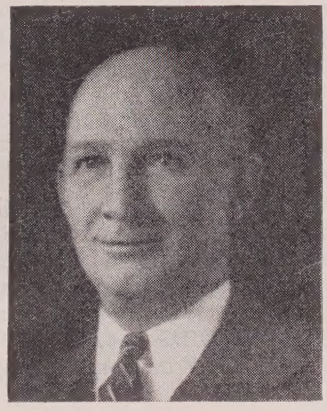

Taking time out for a relaxing chat while the DC-3 is being refueled with Esso Aviation Gasoline are (l. to r.) Howard Zbornik, Celanese Corporation of America's Chief Pilot; Clint Housel, Pilot; and Chuck Nelson, Hangar Manager of Newark Air Service, Inc.

C. J. Strickland, President of Newark Air Service, Inc.

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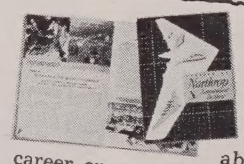

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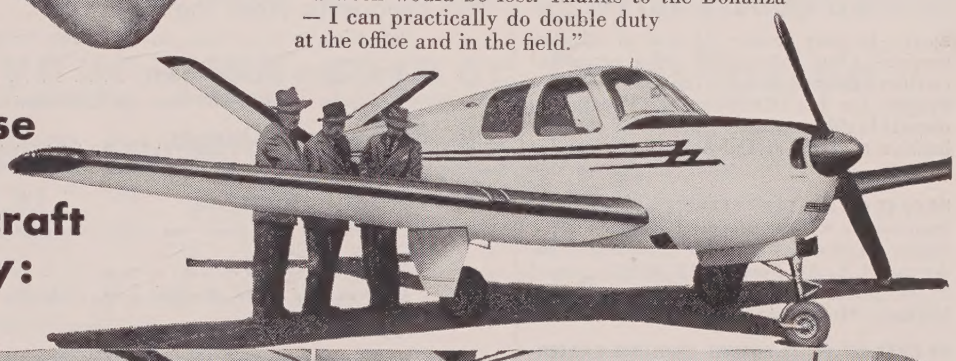
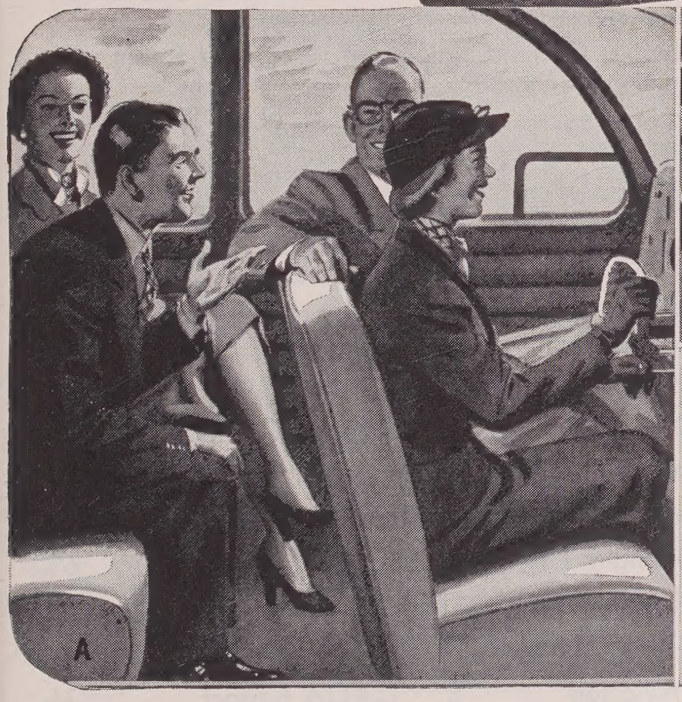
"R. D. Ezell must be twins!"

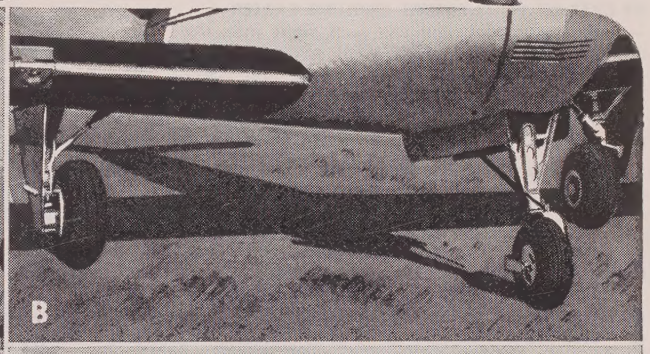
So say branch managers about the executive vice president and general manager of the Roy C. Whayne Supply Co. at Louisville. It's because Mr. Ezell really gets around since his company acquired a Beechcraft Bonanza.

The Whayne Supply Co. operates a huge road machinery business, with branches in Evansville, Indiana; Ashland and Paducah, Kentucky, so plenty of field trips are needed. "The Bonanza is a marvelous engineering achievement — completely dependable, rugged, and fast. I make this trip to all three branches and am away from Louisville only one night. By other means of transportation a week would be lost. Thanks to the Bonanza — I can practically do double duty at the office and in the field."



Check these reasons for Beechcraft superiority:





A ROOM APLENTY for four big men in the spacious cabin. Front seats even more comfortable; new two-position reclining rear seat. Color and upholstery styling all new, too.

B SAFETY—RUGGEDNESS. Low, cross-braced landing gear is wide and long. Rough landings are smoothed. In flight you cruise, using only 65% of the engine's rated take-off power. *Extra* safety margin!

C SPEED and top performance. Take-off horsepower now 205 at 2,600 rpm; new Beechcraft metal propeller has greater aerodynamic efficiency. Short fields no problem! And there's greater economy in fuel consumption, too.

- For full details on the new Model C35 Bonanza, see your Beechcraft distributor, or write Beech Aircraft Corporation, Wichita, Kansas, U.S.A.
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- Higher cruising speed: 175 mph
- Longer range: 775 miles
- Better fuel economy: 19.9 mpg

Beechcraft BONANZA

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SKYWAYS

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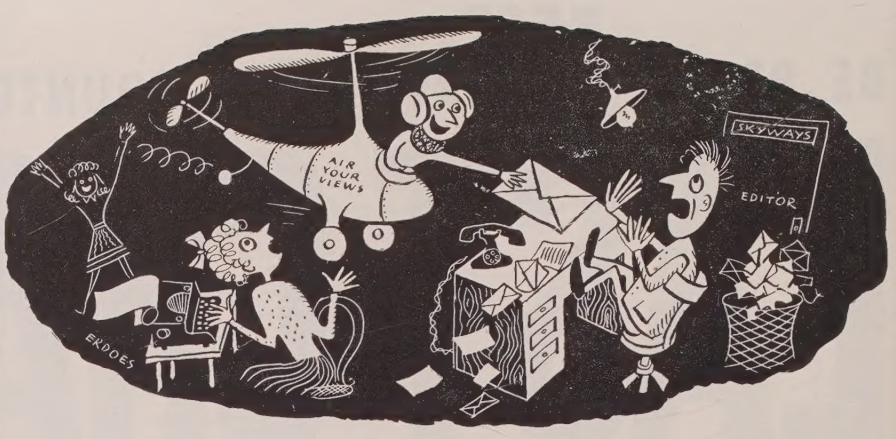


AIR YOUR VIEWS

Air Your Views

Gentlemen:
My attention has been directed to the article which appeared in the January issue regarding accidents and some of the causes. I found it most interesting and informative. This is a story which could bear telling and re-telling and you and SKYWAYS are to be complimented in setting forth the facts, thus making a major contribution to mass acceptance of air travel.

DONALD W. NYROP
Administrator of Civil Aeronautics
Dept. of Commerce
Washington, D. C.

Piper Sky Sedan

Gentlemen:
A few months ago you printed a letter requesting information on what happened to the Sky *Sedan*. I believe the letter was from C. Pfeiffer. Perhaps this info will do: Schweizer Aircraft Corporation, Elmira, N. Y. has in its possession a complete fuselage which was made for Piper. It's all metal and very good looking. When Piper abandoned the *Sky Sedan*, work was dropped, and now the fuselage hangs up on block and tackle at Schweizer Aircraft. Possibly this fuselage could be purchased from that company.

H. R. HAUCK, SR.
Battle Creek, Mich.

Repair in Flight

Gentlemen:
Could you tell me whether or not a mechanic can crawl inside the wing of a B-36 and repair engines in flight?

PFC. C. GAZELLA
Westover AFB, Mass.

If there are "wing-tunnel" facilities for repairing B-36 engines in flight, it is a military secret. According to information we have, there are no such facilities. It might be possible, however, for a mechanic to reach the inboard engines for minor adjustments, but we doubt that it goes beyond that.—ED.

What Turns What

Gentlemen:
Some time ago in an Airman's right or wrong quiz, you stated: "The rudder is used to turn the airplane." "Wrong," says your answer, "the airplane is turned by laying it over on its side and lifting it around through back pressure on the stick." Phooie! When a turn is made there is a simultaneous action of stick and rudder in the direction of the turn. Back pressure must be applied but not for the purpose of actually turning the airplane. When an aircraft is suspended in flight, the lift-gravity forces are in balance, but in a turn there is an additional force to overcome, *i.e.* centrifugal force. As the angle of bank increases and centrifugal force becomes greater, the required resultant (lift vector) also becomes greater and that is where the back pressure on the stick comes in. The increase in lift on going into a turn is obtained by increasing the angle of attack and in a longitudinally stable airplane (no power increase) this demands back pressure. This increase in lift needed in the turn may be compared to a lightly loaded airplane which has little or slight negative angle of attack while cruising. If this airplane carries a heavier load, it must increase its angle of attack until eventually, with a still heavier load, it stalls. I maintain that the rudder is used in establishing the turn for any particular degree of bank (except 90°) while the elevators are applied to increase the angle of attack, supplying more lift to offset the additional loads imposed by centrifugal force.

H. J. WUNDERLICH
Niagara Falls, N. Y.

Thanks for your letter, Mr. Wunderlich. The theory that the rudder is what turns an airplane is a common misconception, according to our leading aircraft designers and engineers and also according to one pilot and author whose reputation as both a pilot and author is widely known, namely, Wolfgang Langewiesche. In his very good book, "Stick and Rudder," Mr. Langewiesche writes, ". . . a turn is flown by leaning the airplane into a bank and then lifting it around, as it were, by back pressure on the stick. The rudder has no primary role in the whole procedure. This may be a new and strange thought to you . . . it is not, as you may possibly think, a pet theory of the writer's. It is accepted by all good instructors and all designers. One definite proof of it is that at least two makes of airplanes have been built which have no rudder at all—not only no rudder pedals, but actually no rudder—and they are nevertheless completely maneuverable, able to execute turns with normal quickness." Actually, Mr. Wunderlich, we haven't space here to go into the whole turn theory. It took Mr. Langewiesche a whole chapter of 39 pages to cover that aspect of flying. Might we humbly suggest that you get a copy of "Stick and Rudder," published by Whittlesey House. You'll find that the author puts holes in a lot of old-time pet theories of flight. What's more, the author's explanations are extremely clear. We'll bet you end up agreeing with him on all counts.—ED.

Mach 1

Gentlemen:
I notice you rate some military plane speeds as equal to Mach 1. I am quite familiar with most airplanes, but I've never heard of such an airplane.

D. SCOTT
Perryton, Texas

Mach 1 is not an airplane, Don, but is the relation between speed of an airplane and the speed of sound. Speed of sound is Mach 1 (763 mph at sea level; 663 mph at 35,000 feet). Mach 2 would be twice the speed of sound, while Mach .9 would be 9/10th's the speed of sound or about 686 mph at sea level.—ED.

Skimmer

Gentlemen:
Could you please tell me more about the Colonial *Skimmer*, the experimental amphib shown in the November issue?

J. JACKSON
Winterset, Iowa

The Skimmer *is a product of the Colonial Aircraft Corporation 23 East Rogue's Path, Huntington Station, New York. It is a pusher-type amphib that seats two or three, is powered by 125-hp Lycoming engine, has a retractable tricycle-type landing gear and is of all-metal construction. It has a wing span of 34 feet, is 23 feet 6 inches long. Maximum speed is said to be 125 mph, cruising speed, 115 mph, stalling, 46 mph, initial rate of climb, 700 fpm, and cruising range is 700 miles.*—ED.

Piper Tri-Pacer

Gentlemen:
Will you give me the specs on the new **Piper** *Tri-Pacer* again, please. I believe an error was made in rate of climb.

L. NORTON
Brooklyn, N. Y.

Right you are . . . we let a typo slip through. The Tri-Pacer's *rate of climb is 850 fpm (not 85). In the pilot's report on the* Super Cub, *we stated. "Coming back into the field we maintained a slow 55- to 60-mph glide with flaps and used up only 600 feet of field." That should have read 60 feet of field. Simply got our "0's" mixed up.*—ED.

Allisons Available

Gentlemen:

At this time I have several Allison V-1710 engines. Could you advise me if there is a market for them?

J. R. BENNET

Augusta, Ga.

We don't know of any one wanting that engine, but might we suggest that you try an ad in our Classified Advertising section.—ED.

D-558

Gentlemen:

Thank you for your reply to my letter concerning Mr. Close's article on the D-558. I suppose our differences of opinion are due to the difference in the envisioned procedure.

Perhaps Mr. Roberts should have mentioned the fact that the gravitational force also varies inversely as the square of the distance from the body and, consequently, less and less power and fuel is required as the rocket moves away from the body.

A. E. FISHER

Thibodaux, La.

Jap Planes

Gentlemen:

When reading narratives of the Pacific War in World War II, I often come across Japanese aircraft referred to by their male code names. Could you please give me rough general descriptions and some performance data on such planes as the *Jack, George, Irving,* etc. Could you also give me similar data (speed, engine, armament, etc.) on the *Hamp?* Was the *Hamp* an Army or Navy plane? Did the Jap Imperial Marines have a flying corps and if so, did they use Army or Navy planes?

F. ROBINSON

Vienna, Va.

The names Jack, George, Zeke, *etc., were given the Japanese planes by American flyers in the Pacific. Purpose of the code names was brevity. The Japanese system of nomenclature made it difficult to identify types of aircraft. Here's what those planes were:* Claude—*Mitsubishi Navy fighter.* Dave—*Nakajima Navy reconnaissance floatplane.* Hamp—*Mitsubishi Navy fighter powered Nakajima 14-cylinder radial engine rated at 1,100-hp at 16,400 feet; low wing, single-seater with top speed of 335 mph at 18,000 feet; armed with two cannon, two machine guns, carried one 500-pound bomb.* Jake—*Navy reconnaissance floatplane; low-wing, powered by radial engine (make and horsepower questionable).* Nate—*Nakajima Army low-wing fighter powered by nine-cylinder Nakajima engine rated at 800 hp at 15,000 feet; armament consisted of two machine guns; had top speed of 270 mph at 15,000 feet.* Nick—*Army fighter.* Oscar—*Nakajima Army fighter (low-wing) powered by Nakajima 14-cylinder radial engine of 1,000 hp, had top speed of 320 mph, was armed with two machine guns.* Pete—*Sasebo Navy catapult reconnaissance seaplane powered by Mitsubishi 14-cylinder radial engine; was stagger-wing biplane with top speed of 200 mph at 5,000 feet, and carried three machine guns.* Rufe—*Mitsubishi Navy low-wing fighter seaplane powered by Nakajima 14-cylinder radial engine rated at 1100 hp at 16,400 feet; had top speed of 265 mph, carried two cannon, two machine guns.* Tojo—*Army fighter.* Tony—*Army fighter built by Nakajima.* Zeke—*Mitsubishi Navy fighter of low-wing design (predecessor to* Hamp*) powered by same engine as* Hamp, *carried same armament, but had slightly different wing shape.* Irving—*Army twin-engine night fighter built by Nakajima, powered by two 1100-hp engines, had top speed of 300 mph and was armed with three or four cannon.* Jack—*Navy interceptor powered by 1875-hp engine, had top speed of about 400 mph. Sorry, can't seem to locate anything on* George. *Will keep checking the files and when that info turns up, will pass it on to you. As to the Jap Imperial Marines, our information does not credit that branch of the service with an Air Arm.*—ED.

Cubs

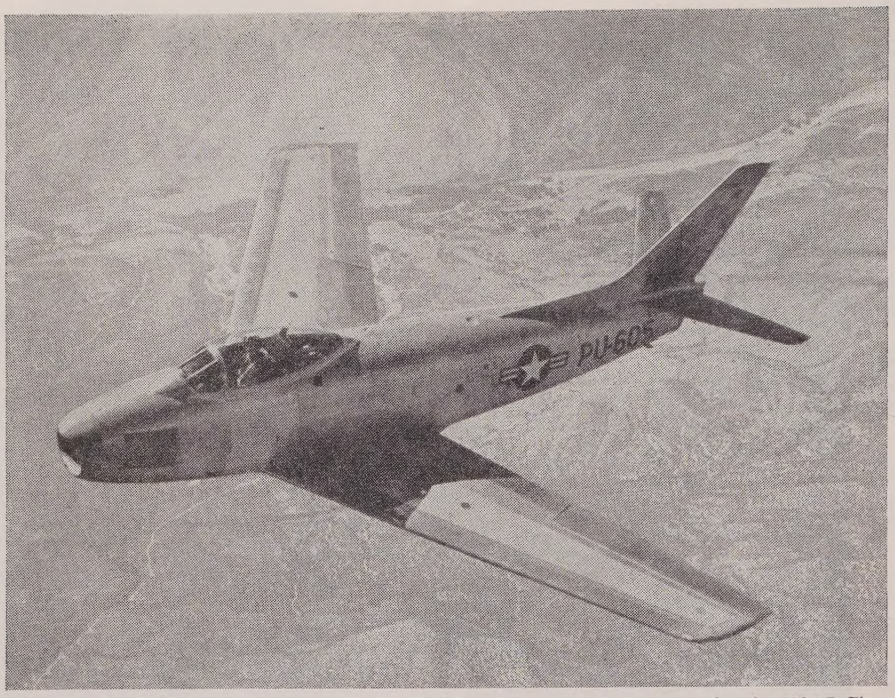
Gentlemen:

In Lieut. Lawler's article on "Cubs for Combat" it is noted that you refer to all liaison planes as Cubs or "Grasshoppers." Aren't those terms limited to Piper *Cubs* only?

A. F. DYE

Regina, Sask. Canada

"Grasshopper" is name given to all lightplanes used in artillery spotting, etc., while Cub is more accepted as strictly Piper property, although the name has been used synonymous with "Grasshopper."—ED.



NORTH AMERICAN F-86's may go to the RAF in exchange for *Canberras* for the USAF. The *Canberra* is a jet light bomber needed to fill a requirement realized since the Korean war

MILITARY AVIATION

Carrier Go-Ahead

The Navy's plans for a new 60,000-ton flush-deck carrier are moving ahead at a great rate. The new flattop probably will take over three years to build and is primarily intended for heavier and longer range aircraft; may be named *James V. Forrestal.*

Sonic-Speed Interceptor

Aircraft and electronics manufacturers have been asked to produce a sonic-speed interceptor which will carry a pilot monitor and an air-to-air missile capable of knocking down an enemy bomber at 60,000 feet altitude. Hughes Aircraft has been assigned development of electronic guidance, but the actual aircraft competition had not been finally decided at press time.

Plane Swap

As we go to press there's a deal cooking between the USAF and the RAF for an exchange of aircraft: the F-86 for the RAF *Canberra* jet bomber. According to word from the U.K., the RAF needs a sonic-speed interceptor able to hold a front-line position until England's Supermarine 535 and Hawker P.1081 are in full production. The USAF, meanwhile, could use the *Canberra* to fill a light-bomber requirement that has been realized since the Korean conflict. The *Canberra* could be used for ground attack or night fighting and coastal reconnaissance. The F-86 costs somewhere in the vicinity of $315,000, fly-away, while the *Canberra* is about a $390,000 airplane.

Navy FJ-2

The Navy has ordered a modified version of the F-86D for carrier operation. Designated FJ-2, it will be a 14,000-pound plane similar to the AF F-86 except for minor modifications.

Navion Jato

Service tests recently were completed with a Ryan L-17B liaison plane equipped with an Aerojet Jato Junior rocket motor. The tests were made to determine the shortest possible take-off distance of the plane. Approximately 40 rockets were fired in 29 flight tests. The Jato performance was perfect in every respect, and the average take-off distance under all types of rough terrain condition was found to be about 200 feet at full gross load.

Flight Endurance

On a test flight recently an RB-36D reconnaissance plane flew for 51 hours and 20 minutes before landing. Route and distance flown were not revealed, but this non-refueling flight is believed to have been of longer duration than any previous B-36 mission.

News Notes

HAMILTON STANDARD recently launched a training program for AF technicians in charge of prop maintenance and instruction at various air force bases. Classes of 12 men each are being graduated every three weeks.

FAIRCHILD ENGINE AND AIRPLANE CORPORATION has announced the election of Paul J. Frizzell as a vice-president in charge of operations of the assistance agreement between Fairchild and the Kaiser-Frazier Corp.

BALTIMORE JUNIOR ASS'N OF COMMERCE recently selected Richard W. "Dick" Darrow of The Glenn L. Martin Company as "Most Outstanding Young Man of the Year." Dick has been Martin's popular director of public relations since 1946.

REPUBLIC AVIATION has announced the appointment of Ken Ellington as Assistant to the President. Mr. Ellington has been director of public relations since joining Republic in 1945, and he will continue to direct the corporation's public relations activities.

REPUBLIC also announced the appointment of Joseph Andreini, former production manager, as factory manager.

NORTHROP AIRCRAFT has received a letter of intent from the USAF for a substantial additional number of F-89 all-weather interceptors. This new order boasts Northrop's current backlog to about $180,000,000.

MICHIGAN reports the appointment of Col. Lester J. Maitland as its new Civil Defense Director.

PACIFIC AIRMOTIVE has named Col. "Luke" Harris as general production manager of the Burbank Engine and Aircraft Divisions, and the Chino-Ontario Aircraft Division.

LOCKHEED AIRCRAFT has signed a contract with the Kaiser-Frazer Corporation for the fabrication and assembly of components of the Lockheed P2V patrol bomber.

NATIONAL AERONAUTICAL CORP., perhaps better known as NARCO, recently purchased a new building for expansion of their production facilities at Ambler, Pa. Increased commercial orders and military commitments brought about the need for expansion of their facilities.

EASTERN AIR LINES' Capt. Eddie Rickenbacker recently announced the appointment of William Van Dusen as special assistant to the President and General Manager. An international authority in the field of air transport and the dean of aviation publicists, Van is probably one of the best known and most highly regarded figures in the air industry. For 20 years he directed public relations for Pan American World Airways, then left Pan Am to devote himself to independent consultation work and to writing.

ATOMIC ENERGY COMMISSION announces the promotion of R. W. Cook, manager of Oak Ridge operations, to Director of Production. A veteran in atomic energy work, Mr. Cook was awarded the Legion of Merit for his work in the Manhattan District organization. Mr. Cook succeeds W. J. Williams who recently was named Deputy General Manager of the Atomic Energy Commission.

LYCOMING DIVISION of Avco Mfg. Corp. is leasing the former Chance Vought plant at Stamford, Conn., for the manufacture of Wright R-1300 and R-1830 engines. These engines power the T-28 trainer and several helicopters. Lycoming's main plant is located at Williamsport, Pennsylvania.

Navy's New Sub Hunter

About to take off from its carrier deck is a GRUMMAN GUARDIAN, a plane designed to find and destroy enemy submarines. Some GUARDIANS, of which this is one, are equipped with long range detection devices. Others, lighter on radar but heavier on bombs, come in to make the "kill." True to their name, these versatile carrier-based aircraft serve as round-the-clock guardians of the fleet.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE, LONG ISLAND, NEW YORK

Contractors to the Armed Forces

JET FIGHTER vs. Super-Bomber

Are super-bombers immune to fighter attack? World War II ace thinks not

THE Machmeter on the fighter's panel registered .7, and Lt. Cunning began a gentle left turn. The "pip" of the gyro gunsight covered a tiny but rapidly growing speck—an enemy four-jet bomber. Cunning tightened his turn. The accelerometer needle touched 2 g's. Rockets ready, Cunning's forefinger curved around the trigger. "Twenty seconds," he mumbled into his oxygen mask. "Ten seconds . . . FIRE!"

Two rockets trailing corkscrews of black smoke swooshed from beneath the fighter's wing. Then two more . . .

The ground radar station recorded the victory.

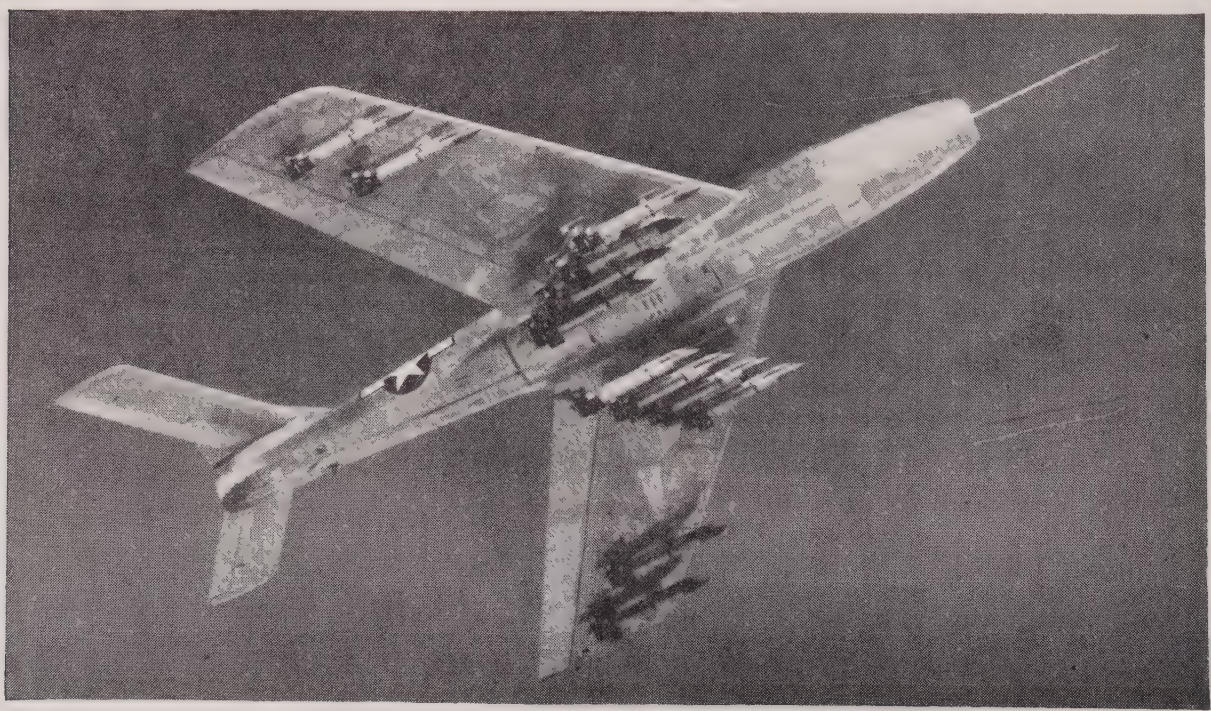
Impossible? No! Even though the ardent advocates of the so-called invincible bomber may scoff at the idea of a manned interceptor, the single-seater fighter still has a definite place in our line-up for national defense.

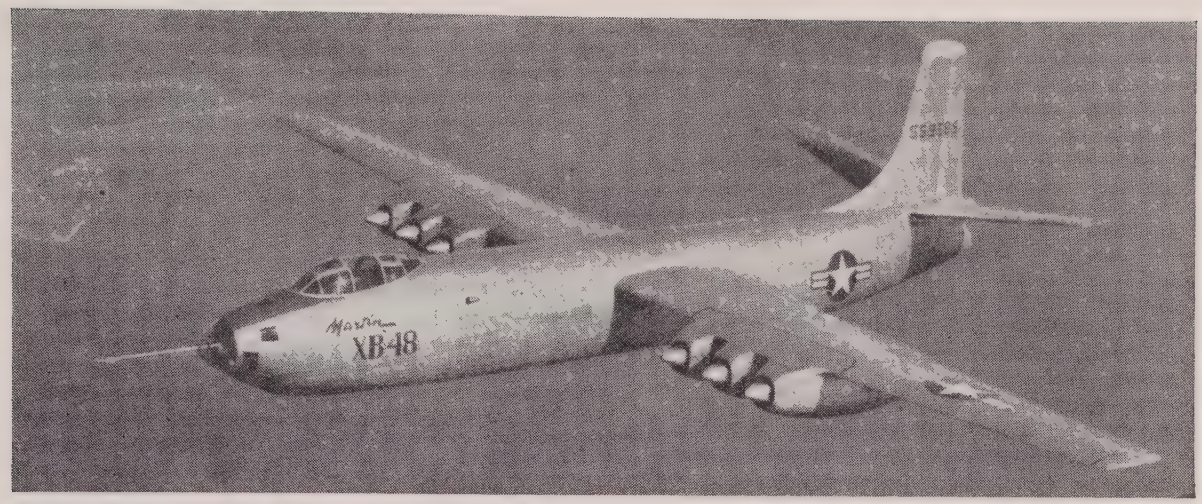
Ever since the first bomber was built, designers have been dreaming of a ship able to perform its mission as a bomber and still remain capable of out-running hostile fighters. Several times in the history of military aviation, this dream has come true. As a matter of fact, virtually every bomber prototype has, in some respects, been superior to production fighter aircraft. This follows the oft-repeated contention that by the time a military plane goes into production it is already obsolete. It has been the desire for safety in superior speed that has motivated strategic air-planners to abandon existing airplanes, and strive for greater speed. This superiority, however, has always been short-lived; history has consistently shown that for every superbomber that has come to claim immunity from fighter attack, some fighter has arrived to claim the Blue Ribbon of the skies.

This see-saw struggle for supremacy dates back to World War I. One classic example was the beautifully engineered B-17 of World War II. When the first bomber group of the 8th Air Force arrived in England, the B-17 boys were all set to show the world how unnecessary the puny fighter plane was. The B-17 boasted unheard-of armament, its ceiling would make any pea-shooter dizzy and, of course, its speed was in the general class of the top fighters of 1942.

When the B-17's started their daylight opera-

JET FIGHTERS such as new Republic F-84F have speed, power to knock out enemy provided radar guidance is good





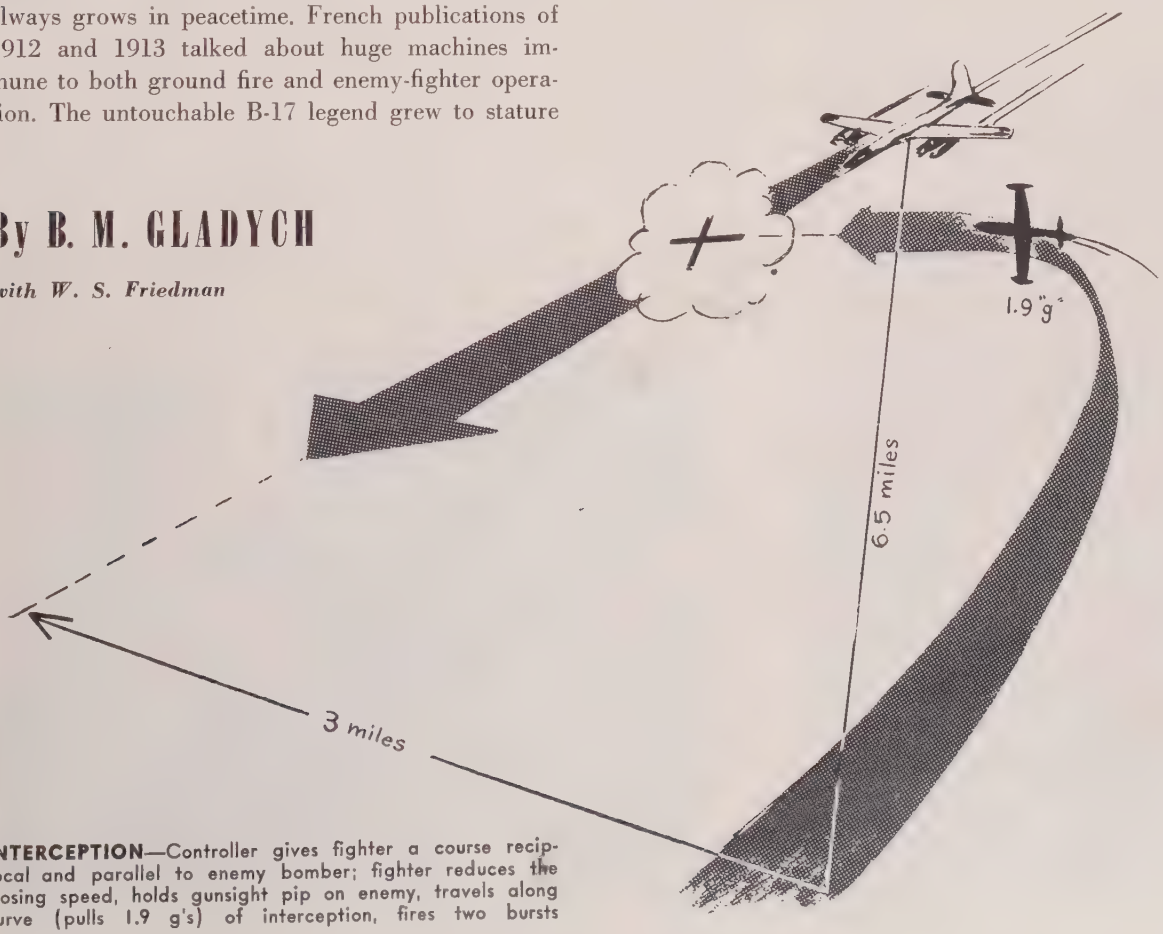
JET BOMBERS such as XB-48 *(above)* or B-47, according to arm-chair generals, could get to target at subsonic speed

tions, the range of most contemporary fighters was short, and they were unable to participate in the deep-penetration missions planned for the bombers. However, the appearance of the first external fuel tanks that stretched the range of the P-47's and P-38's made the Big Friends very happy for the little fellow's company, particularly after the B-17 losses for such missions as Schweinfurt were finally totaled up.

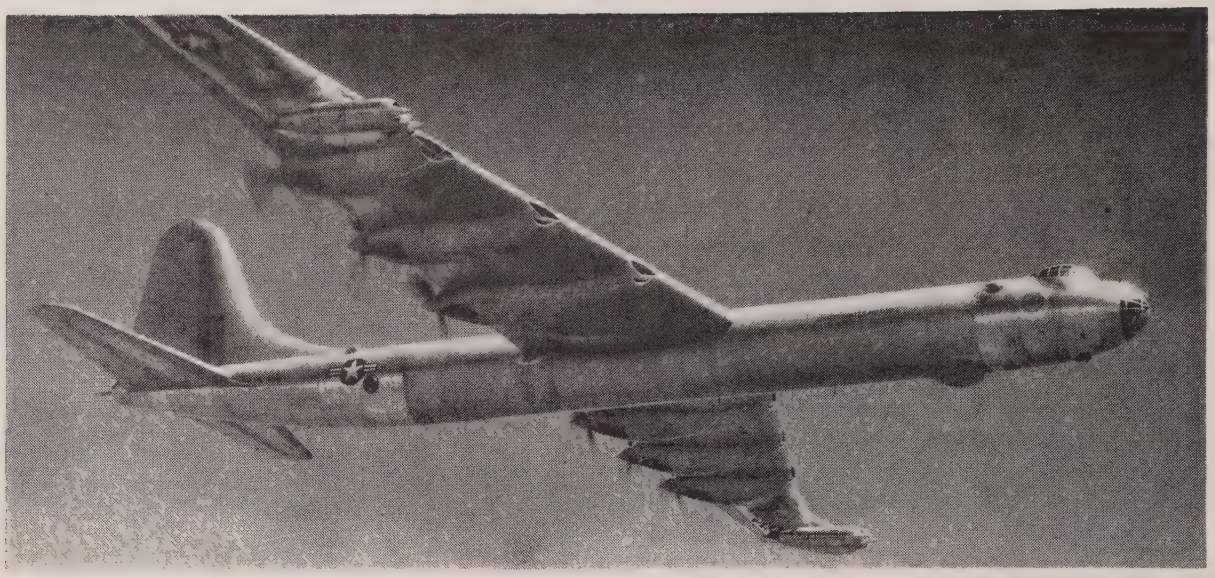
Strangely enough, the legend of the superbomber always grows in peacetime. French publications of 1912 and 1913 talked about huge machines immune to both ground fire and enemy-fighter operation. The untouchable B-17 legend grew to stature during the late '30's. Now the superbomber doctrine has more followers than ever before, and the B-36 reigns over the "wild blue yonder" to the whisper of arm-chair strategists who wonder why the Air Force continues fighter aircraft. "Even if we were attacked by fast jet bombers," pronounced one pundit, "our guided missiles would be able to take care of the enemy. Why build fighters and train pilots?" This opinion (*Continued on page 12*)

By B. M. GLADYCH

with W. S. Friedman



INTERCEPTION—Controller gives fighter a course reciprocal and parallel to enemy bomber; fighter reduces the closing speed, holds gunsight pip on enemy, travels along curve (pulls 1.9 g's) of interception, fires two bursts



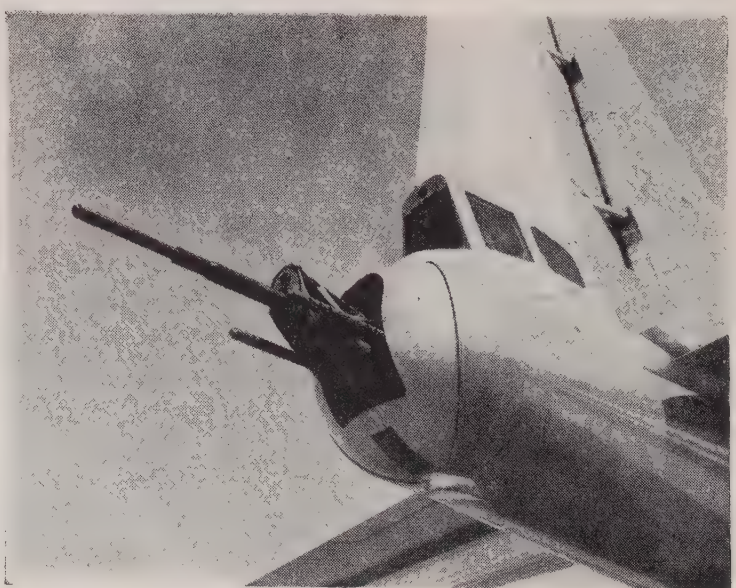
STRATEGIC BOMBER such as B-36 probably could not be knocked down unless fighter used 20-mm, 23 or 32 class cannon

stemmed—and still stems—from one of our prominent research engineers. Naturally—a guided missile expert.

One must concede that the manned fighter interceptor or escort fighter has its limitations. But like any other weapon, its primary limitation is the man behind it. In the case of the fighter airplane, it is the pilot whose physiological and psychological requirements have to be met. In addition to the mass of instrumentation and electronic equipment that the modern jet fighter must carry to permit the pilot to perform the basics of his job, the jet fighter must carry equipment to make the cockpit habitable at high altitudes and at great speeds—supercharger equipment, refrigeration units to neutralize the heat accumulated from engine, etc. These items, plus such articles as ejection seats and anti-g devices complicate the procurement and maintenance of the fighter plane, and tend to jack-up wing loadings, somewhat to the detriment of the fighter's turning performance.

One of the pet arguments *against* the manned fighter is that it is unable to engage the enemy bomber that is on the verge of compressibility. That cozy foxhole-for-bombers theory stemmed from the initial investigation of supersonic flight and its presumed and actual dangers.

The so-called sonic barrier has been "crashed" any number of times. The original theory was that the zone of speed approaching, arriving at, and passing that of sound presented a number of virtually insurmountable problems. Early in the game, the best that was hoped for was an uncomfortable passage as the airplane, propelled by an extra burst of power, was virtually blasted through the transonic band. The reason for this discomfort is mixed airflow. The contours of an airplane are such that while the air moving over some parts of the machine are passing at a speed faster than sound, others are still subsonic (below the speed of sound) and are governed by the physical laws applied to this range of speed. This mixed-flow phenomenon originally resulted in a lot of unexpected behavior on the part of the airplane, and such phenomena as control reversal, etc., made ulcers an occupational ailment for fighter-plane designers. (*Continued on page 40*)



TAIL TURRET of the B-29 *(right)* packed too much wallop for rear attack by enemy

TAKE-OFF was from Edmonton, Canada. Destination was 1,000 miles north. It was on the return trip that it happened

Forced Landing

The C-54 was overloaded, then its radio went out, weather closed in

By BOB ARENTZ

THE moral of this story is that it's the little things piling up that can get a pilot into trouble. After that, it is training, judgment and skill that really count.

The operation was a bear-cat. You add 60-below zero weather to an endless, frozen northern wilderness, subtract radio ranges, commercial broadcast stations, landing fields, towns or other landmarks, then add arctic blizzards, incalculable winds, low ceilings and poor visibility, and impossible conditions for weather forecasting—and you have it. Far-flung, 1,000-mile flights over non-existent airways to tiny isolations above the 67th parallel by the Alaskan Division of the Military Air Transport Command.

Seventy-five per cent of the northern MATS terminals are nothing but snow-rolled runways on ice six feet thick with the arctic ocean underneath. Depth perception is difficult at all times and only flare pots outlining the strips make it possible to land a C-54 while skies are overcast.

Considering weather and all, you can easily see why the crew of MATS 5598 thought they were lucky to have nothing more than daylight and visibility to the ground when the last of their four engines stopped running and they faced a dead stick landing a long, long way from home.

It's an interesting little question. What do you do with a 30-ton airplane when all four fans are dead? Better still, what series of little things piling up can lead to the moment when the last engine stops and you are sitting 10,000 feet above the arctic wilderness with a quarter-million dollars worth of Uncle Sugar's property and several men whose lives are dependent upon your judgment?

Due to cold-weather maintenance problems, and hard usage of the aircraft, the MATS crews in Alaska are on a stand-by basis and they go as soon as cargo loading and maintenance are completed. It is common practice to leave at 3 o'clock in (*Continued on page 38*)

SKIPPER of the MATS C-54 was Lt. Seibert (*left*), veteran Alcan flyer

CHAMPION in role of close-support, the Douglas AD *Skyraider* is armed with two *Tiny Tim* rockets, 12 HVAR rockets: a punch equal to broadside from a cruiser

Navy Skyraider called "most effective plane in use;" can carry three tons of bombs, or aerial torpedo, rockets and cannon

By GILBERT CLOSE

SKYRAIDERS get set for take-off from a carrier for attack on Chinese Communists

BROADSIDE from the SKY

FRONT-LINE G.I.'s and Marines in Korea claim there are two ways in which they can get their hair parted neatly down the middle—use a comb, or forget to duck when the Navy's earth-skimming AD *Skyraider* attack bombers come over on a ground-support mission.

This is not exaggerating it too far. The *Skyraiders* have to swerve to miss trees and climb over low hills when they come in for the kill. Every AD pilot in Task Force 77 is aware of an Operations Order which, while humorous in its wording, is deadly serious in intent: "Window peeking is permissible at all times."

Take the case of the AD pilot pursuing the North Korean train loaded with war materials. He was gaining rapidly, with the shiny tracks streaking low beneath his wings like billets of steel spurting from a steel mill's hot rolling machine. The pilot's finger was itching on the trigger of his 20-mm. cannon when, with a final puff of triumph, the train plunged into the maw of a chiseled tunnel carved through a rocky ridge. Without hesitation or deviating his flight line except to drop a bit lower, the pilot transferred his hand from the cannon trigger to the rocket release. Five-inch HVAR rockets spurted forward from beneath the wings and followed the train into the tunnel. The only thing that came out the other end was some curling powder smoke and a cloud of rock dust.

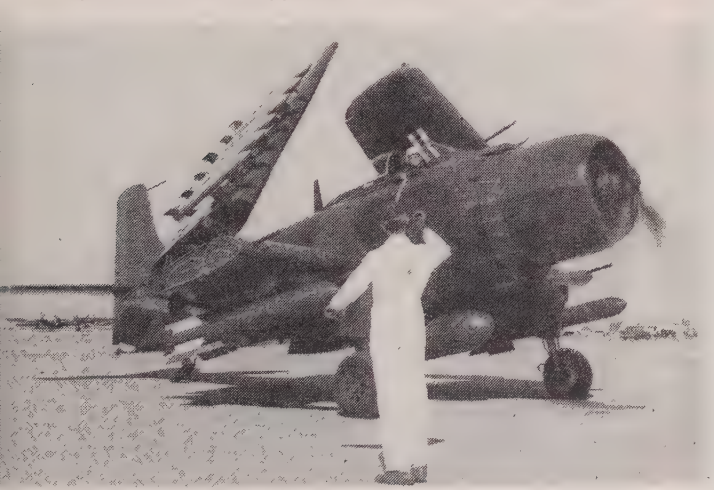
ORDNANCEMEN check bomb fuses on heavily loaded Navy *Skyraider*. Men are G. Spangler, J. Ramsey, W. R. Brundette

This is only one incident among hundreds that have found their way stateside in naval news releases attesting to the low-level efficiency and tremendous striking power of the Douglas-built, propeller-driven AD *Skyraider* attack bomber. The Navy is not prone to give praise unless such praise is well deserved. Individual Navy officers are even less prone to give praise unless they can back their words with concrete examples.

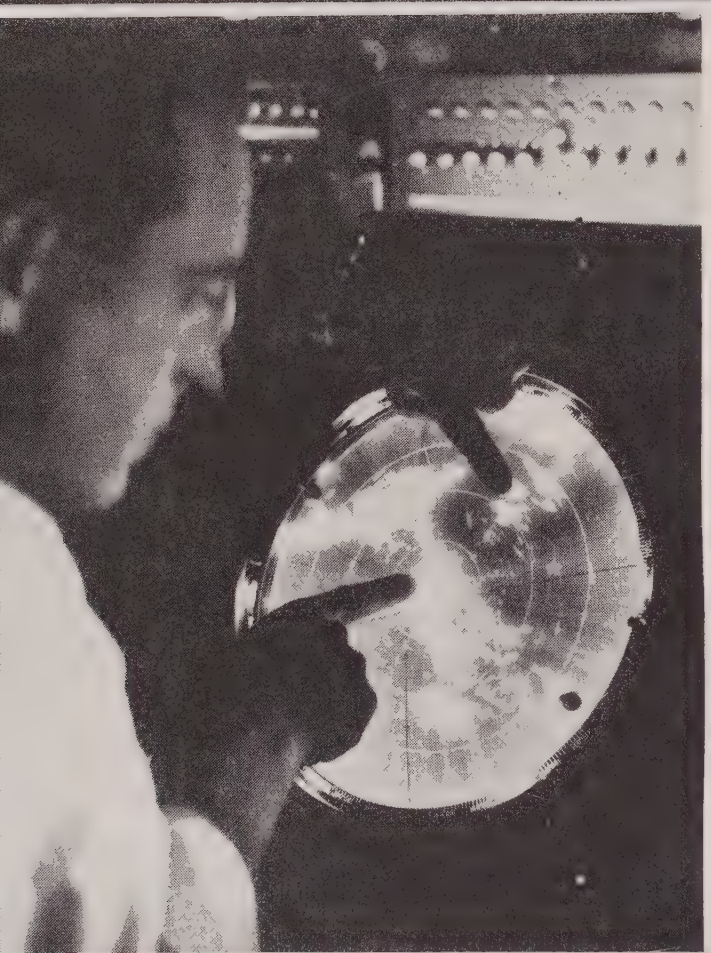
Yet in a press conference on the flag bridge of the *USS Valley Forge*, held just prior to the carrier's departure for re-outfitting in home waters, Rear Admiral John W. Hoskins had this to say: "After having seen the *USS Valley Forge Skyraiders* thrown against the enemy on 3 July and continuously since in support of our ground forces, I am convinced that the *Skyraider* is the best and most effective close-support airplane in the world today. It can carry more bombs farther than any other single-engine plane. It is steady in its dive and almost unbelievably accurate in its firing. . . . We can, through proper communications, lend close support to our ground troops within 50 yards of their lines."

The Admiral could have backed up his "unbelievably accurate" statement by pointing to the Yalu River bridges as an example. The Yalu River is a stream, half mud and half water, chewing its way along the North Korean-Manchurian border. During the final phases of the fighting in North Korea, prior to Red China's intervention, it was evident that the Yalu River (*Continued on page 42*)

NEWSMEN, PILOTS call the Douglas AD "tops in the Korean war against Communist aggression." There are 22 versions of the AD



LANDING SIGNAL OFFICER and his assistants watch *Skyraider* settle to deck of Task Force 77 carrier after raid on Reds



WEATHER closed in at Los Angeles International Airport, the GCA controllers go to work to keep traffic moving safely. Operator (*left*) is shown here pointing out area obstructions as they show up as pips on the scope of the ASR

Zero Zero Talk-Down

By DON DOWNIE

"DO YOU mean that you can talk me down?" The private pilot of the *Navion* was on top of the overcast, lost at night. He knew that he was somewhere near Los Angeles on a flight from Palm Springs, but he didn't know how to get home.

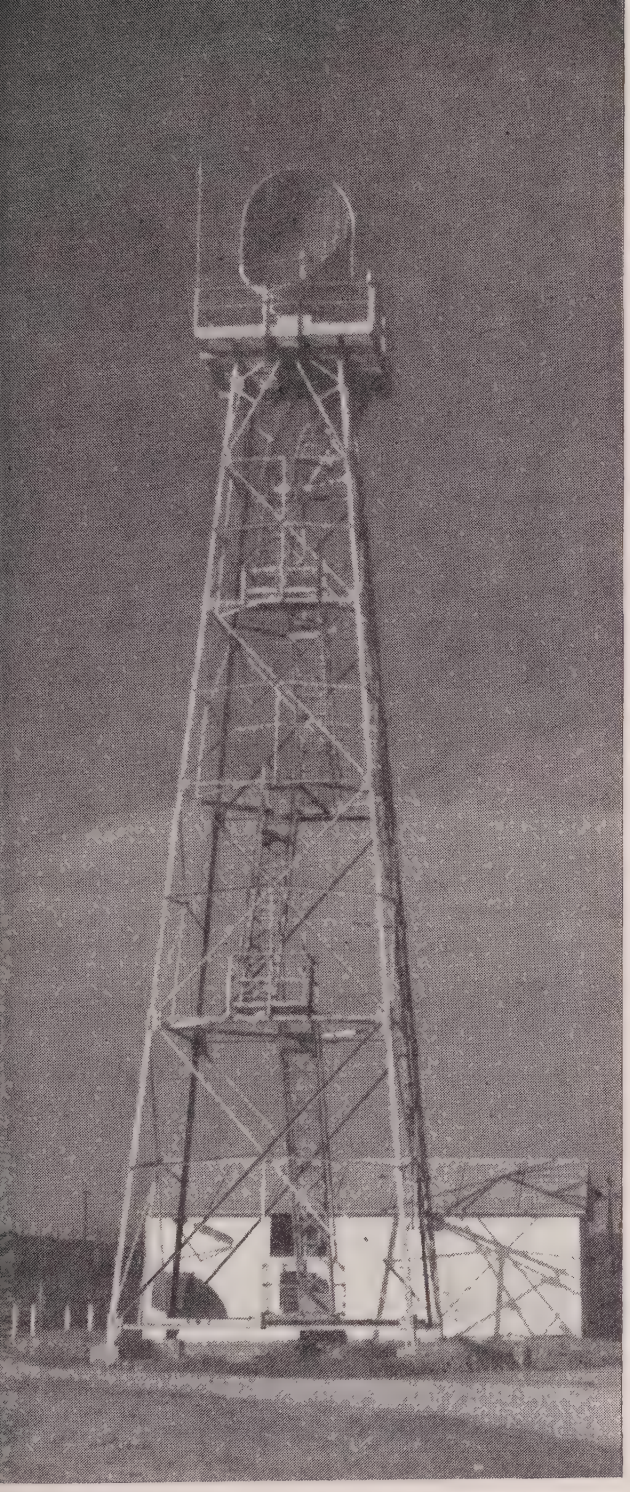
Fortunately, he was able to contact the Los Angeles International Airport control-tower operator. The man behind the glass told him that he was out over the damp Pacific Ocean, half way to Santa Catalina Island. The tower operator asked if the pilot wanted to make a GCA (Ground Controlled Approach) let-down, and the pilot answered "negative."

After a few minutes of continued futile flubbing around, the pilot was again asked if he wanted an emergency assist from the GCA radar unit.

"Apparently the pilot didn't know what GCA was," said the tower operator, "because he asked if we could talk him in." When he found out that we could, his reply was "affirmative" and the tower operators vectored him over the airport and down from his on-top altitude of 5,000 feet through a solid overcast to break contact under an 800-foot ceiling. Investigation showed that this pilot had had no previous instrument experience but his let-down and landing were uneventful. The pilot, a clothing manufacturer, was so grateful for being rescued from this jam that he sent a sports shirt to each of the five operators that were in the tower that night.

This radar-to-the-rescue has become almost routine for the tower operators at the Los Angeles International Airport. In the first seven months that the CAA's first permanent GCA unit for airline terminals has been in operation, controllers have made nine "emergency assists."

"We don't call them 'saves,'" says Chief Airport Traffic Controller R. N. Lemmer, "because the air-



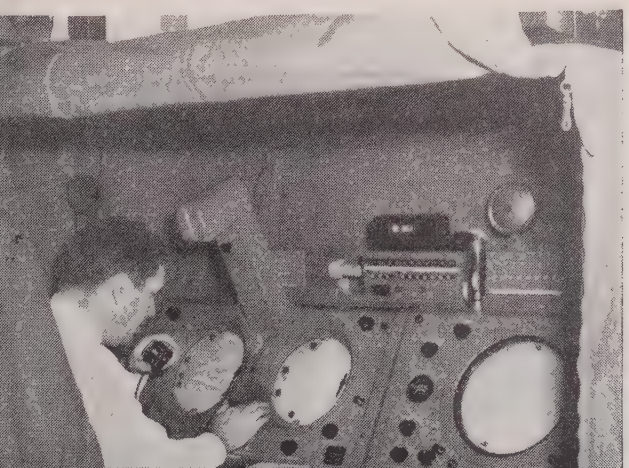
OPERATORS in regular control tower on clear day or night have few difficulties. But when fog rolls in, it's the GCA Surveillance Radar antenna *(left)* that puts an accurate picture on the scope of aircraft within 30 to 60-mile radius

craft might have been able to get down in some other manner. Five of these nine emergency assists, however, were of light personal aircraft."

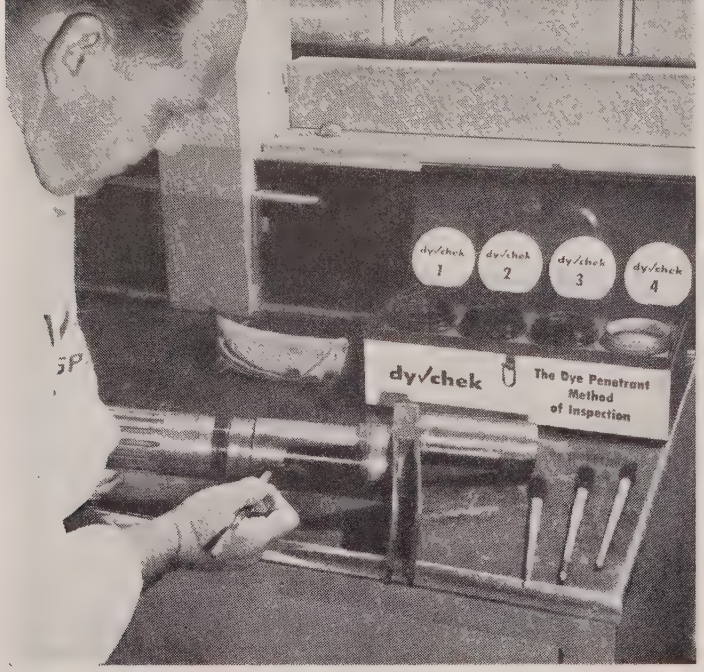
Recently a Stinson took off at night for a contact (VFR) flight to San Diego. Eight minutes out, the pilot called in on radio that he had oil all over his windshield and his engine was running rough. With the obscured windshield, he couldn't find the airport but he could see a high radio tower out his side window. The surveillance radar scope identified him as being near the KNX radio towers, and the operator gave him a straight-in heading to the airport. Because of the oil on the windshield, the pilot lined up 400 feet to the left of the runway on his final approach and the GCA operator talked him down with proper corrections to a safe landing. His engine quit cold as he crossed the edge of the airport. Subsequent checking showed that the oil cap had been left off the engine and all the lubricant had siphoned out in flight. After 12 minutes in the air, the engine just froze up and quit.

The pilot of another Stinson, on top at night, called in that he believed (*Continued on page 44*)

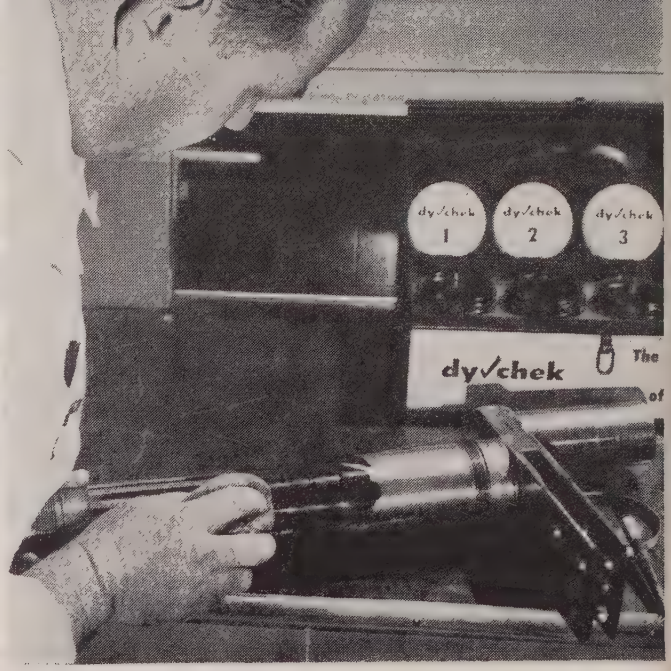
APPROACH CONTROL operator (PAR) goes to work "under the hood" during daylight hours at Los Angeles airport



NIGHT OPERATION of the PAR scope poses no operator problems of poor scope visibility because of outside daylight



METAL CLEANED by liquid in Jar 1, technician applies dye penetrant (Jar 2) to shaft suspected of having flaw



TEN MINUTES after dye penetrant was applied, technician uses solvent (Jar 3) to remove red dye from metal

Red Means Danger

By JAMES JOSEPH

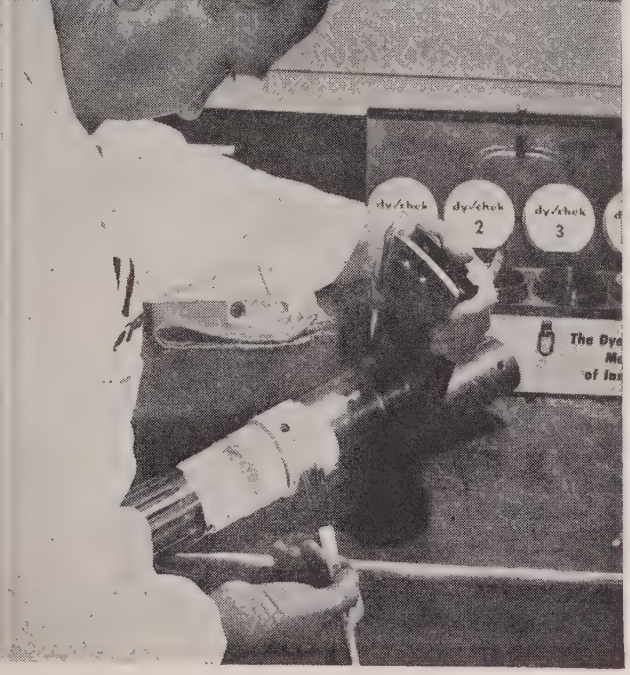
YOU'RE bringing your plane in for a landing, you misjudge the wind, and the airstrip comes up hard and smacks you. Hard enough, in fact, to damage your landing gear. So you taxi gingerly up to the line, climb out and have a look, but you see nothing. No visible cracks in the metal, no dents or bends. But you're still not satisfied because maybe one more landing as hard as the last and you'll start scooping up clover.

Or maybe the prop hub has been spinning a long while—long enough for metal fatigue and crystallization. You suspect a flaw in the metal—somewhere. Still, you can't see anything wrong and even a powerful glass doesn't reveal a crack.

But safety's sake nudges you and says "pull the thing off and have it inspected."

Just about the time you've decided it's got to come off, a guy in white coveralls suddenly appears from the general direction of the hangars and, without a word, starts looking over your landing gear and prop hub, just as if he were a guy who

CUB PILOT made a rough landing just prior to this mishap. Landing gear struts were damaged but showed no visible crack, dents, etc. On next landing, however, the gear collapsed causing extensive damage to the airplane



TECHNICIAN next applies white chalky developer (Jar 4). It dries immediately, disclosing outline of red penetrant

knew exactly what was going on in your head.

"Figuring to send these parts to the shop?" he asks.

You nod.

The guy says, "Hold off a minute and we'll see what's what."

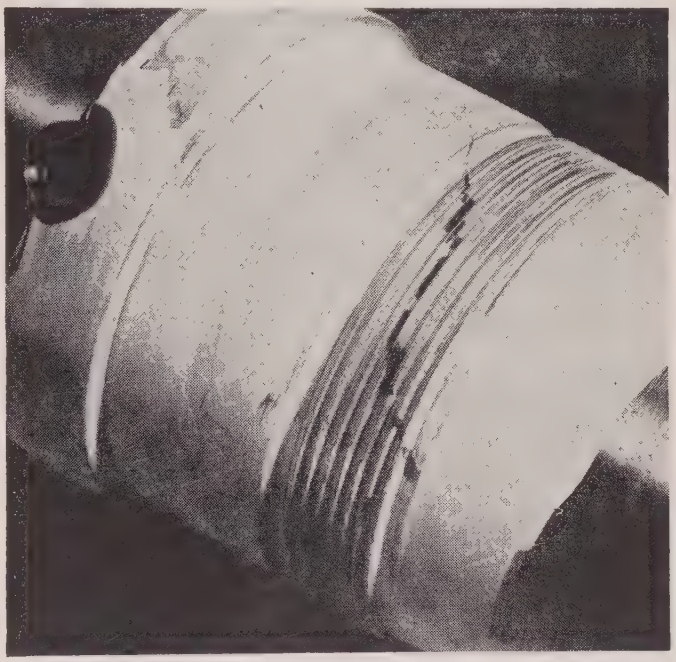
He opens a pint-sized kit he's carrying, takes out a couple of paint brushes, and squats down to work your landing gear over.

From four bottles and a couple of paint brushes you're about to see some 30th century magic which may drastically short-cut plane maintenance in the future.

First off, the man in the white coveralls sizes up the landing gear. Wherever he suspects the greatest tension and strain, he starts cleaning the metal off—using a rag dipped in solution from one of the bottles he's carrying. When the metal is dry and clean around the suspected points of stress and fatigue, he takes out a paint brush, dips it into one of the bottles that contains a brilliant scarlet dye and dabs a coating of the red stuff over the spot he's cleaned.

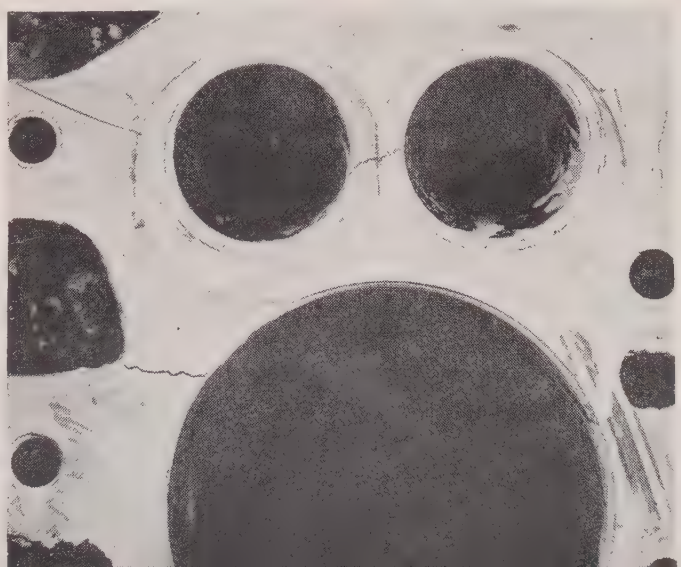
Then he takes five—and sits back to tell you about a startling new discovery which engineers and metallurgists at Northrop Aircraft, Inc., developed during research on the company's gas-powered turbine engine, one of the most powerful (in excess to 10,000 shaft horsepower) prop engines yet built. You're seeing a field demonstration of a process called Dye Penetrant Method—or just DPM for short—which may mean lives and money saved for the private pilot. It's a method which quickly and accurately checks for surface flaws and for sub-surface crevices and structural weaknesses so long as there is some surface manifestation of the trouble. He tells you that within 10 or 20 minutes, depending on the metal and the part, this dye penetrant will detect metal fatigue, crater cracks, flaws, porosity and plenty of other metal ills—all without disassembly. And it works equally well on magnetic or non-magnetic metals, on steel, stainless steel, nickel, nickel alloys, magnesium, titanium, copper, brass, aluminum, aluminum alloys, and cobalt.

As the scarlet dye begins to penetrate the metal of your landing gear, he goes on to explain the theory behind it all. How, for instance, metal experts like Rebecca H. Smith, chief metallurgical engineer for The Turbodyne Co., helped take an old theory and modernize it. The old theory said that if a highly penetrating liquid, with very high capillary attraction and a (*Continued on page 50*)



FISSURE shows up on threaded portion of crankshaft. By shape of line, depth and width of flaw can be estimated

MOTOR BLOCK on which dye penetrant method has been used shows two definite fissures heretofore undetected by A&E



TARGET FASCINATION is recognized as a real danger. Therefore, AF has set minimum altitudes for all gunnery runs

TARGET *Fascination*

By 1st Lt. MEL PORTER, USAFR

IT STARTED out as a normal dive run on a couple of tanks at a crossroad. The warmth of the sun shining through the bubble was comfortable, the earphones hummed softly in my ears. The chatter of the 50's leveled into a metronomic drone, and the tracers lobbed down ahead like white thread streaming from a handful of falling needles.

Suddenly the radio cut out—dead. It woke me up to realize that as far "up" as my vision could travel was the green grass of rolling meadows. I was going right into my target. There was no time to judge the pull-out. It was simply a case of hauling back on the stick and starting the prayer. Somehow, the ship shuddered across the road, and I remembered a pinging sound through the fuselage—then I blacked out.

I came to going straight up, back into the welcome sunshine, and leveled off. Boy, was I shaking! After I landed, they showed me the leaf stains on the bottom of the ship, and the mud dents where I flew through the stuff my 50's had kicked up from the road.

When I explained it to the Flight Surgeon, I told him it felt like I was asleep, or hypnotized.

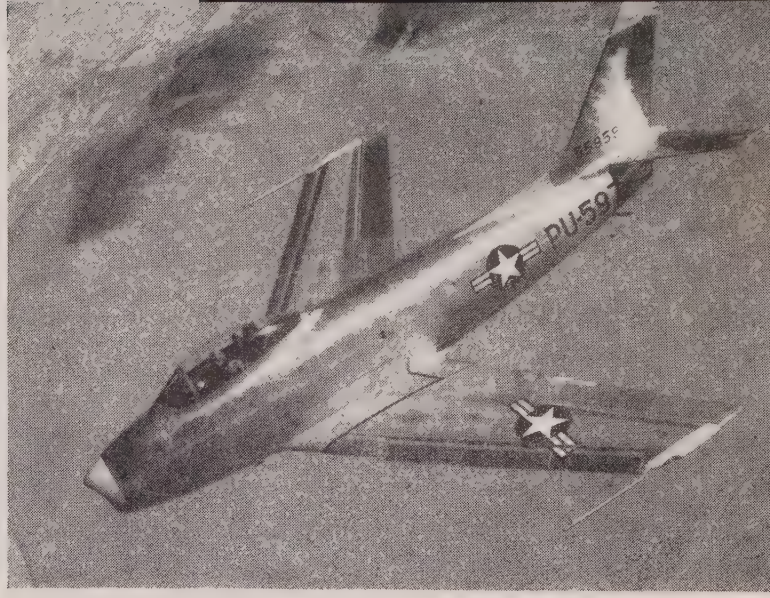
"You were!" he said. "It was lucky your radio cut out and snapped you out of it."

He didn't know how lucky. It was a piece of enemy flak that stopped my radio.

The Flight Surgeon further added: "You were a victim of a sort of psychological cockpit fog we call 'target fascination.' You got so engrossed in your

TOTAL CONCENTRATION on a target, fixed attention and over-familiarity have written up many a pilot's obituary

FIGHTER PILOTS in jet planes who come in below minimum altitude permitted in gunnery competitions lose scores



JET PILOTS probably do not experience target fascination as often because "you don't walk home from a jet crash"

work you simply forgot everything but that target."

He was right and I knew it and he knew it and I sweated plenty. I was more scared thinking it over than I was when it happened.

Then I began to wonder about this thing called "target fascination." It was dangerous, I knew, but how prevalent was it? What kind of people were susceptible to it? Did it give warnings? What factors led to it? I had experienced it and lived to wonder about it. What about other pilots? I began to ask questions.

Jerry Williams, star halfback of the Los Angeles Rams professional football team, was a star P-38 pilot in the South Pacific. He had 27 missions under his belt and knew his business well, but . . . In his words:

"On an armed-reconnaissance strike over Luzon, we spotted several Japanese trucks parked under trees beside a road. I radioed half the flight to follow me down, and peeled off. With the speed we had, it was hard for me to hold the ring down on target, but I finally got one of the trucks lined up, and started feeding lead into it. It wasn't until my guns exploded the truck that I saw how low I was. The image of the truck, just the second it blew, seemed to fill the whole sight. I don't know, it happened too fast, got too mixed up in my mind for me to say, but I remember pulling the stick back as far as I could and then I blacked out.

"The rest of the flight told me later, they'd been screaming at me in the dive, and that I had missed the ground by not more than 20 or 30 feet. I guess I was oblivious to everything for the last couple of thousand feet, because I practically melted down the gun barrels with a long burst that I must have held for at least 10 or 12 seconds. That's five times as long as I ever squeezed a trigger. And I remember nothing of that dive from the time I lined up on my target until it exploded. At 500 mph, that's too long to be flying unconscious."

Robert S. Faulkner is a production test pilot for Lockheed Aircraft. When I asked why there were so few case histories of jet pilots experiencing target fascination, he came up with the very obvious answer. "You don't walk home from a jet crash."

Faulkner flew 72 missions in P-51's with the 8th Air Force over Germany. He has flown jets for two years, F-80's in Alaska, (*Continued on page 52*)

THUNDERBOLT pilot started normal dive on tank; woke up going right into target

BLACK CATS included Johnson, MacDougall, Goebel, Nichols, Richter, *(kneeling)* McClellan, Greenwall, Matlock

13 Black Cats

ROPE-LADDER STUNT called for one of the Black Cats to hang by his heels from an 80-mph rope-ladder trapeze

By KENNETH "FRONTY" NICHOLS

as told to Bill Kyle

IF THERE'S anything to the theory of an after-life on another planet then I think I know who's herding those flying saucers around earth. It's the already departed members of our old stunt-flying outfit still upholding our motto—"If a Black Cat can't do it, it can't be done!"

Our business announcement read like a one-way ticket right out of this world.

Mr. Movie Director: Sept. 4, 1925.

Introducing the "13 Flying Black Cats of Hollywood," the greatest stunt men, and the only flyers who will do anything at fixed prices. When you need stunt men, call us up—we will furnish men for any kind of work—aeroplane, automobile, motorcycle, etc. The price list attached is a guaranteed price on each stunt and includes all necessary equipment to complete the stunt required, with the exception of the trains. In other words, if you want a

WING-WALKING ACT had Matlock, Johnson and the author balanced atop *Jenny* wing. MacDougall was at controls

FIRST JUMP coming up, Fronty Nichols gets a good-luck wish from MacDougall. Nichols' chute was homemade one

GIRLS sometimes worked with Black Cats, but were never made members. Here Gladys Ingle makes a plane change for cameraman

PLANE-CHANGER Gladys climbs aboard. Pilot at the controls of the plane was Art Goebel

picture of a ship change, we furnish the camera ship, two ships to make the change, stunt men, and guarantee to get you the picture for $100—no more! We have high-powered aeroplanes, fast racing cars and all the necessary equipment for our work. Call us up when you want stunt men or work at the lowest possible price.

Crash ships (fly into trees, house, etc.)	*$1200*
Loop with man standing on center section	*150*
Loop with man on each wing, standing up	*450*
Ship change	*100*
Upside down—ship change	*500*
Change—aeroplane to train	*150*
Change—automobile to aeroplane	*150*
Change—speedboat to aeroplane	*250*
Change—motorcycle to aeroplane	*150*

PILOT-AUTHOR Fronty Nichols was one of the three men who started Black Cats

Parachute jump	*80*
Parachute races (two jumpers)	*150*
Ocean landing	*150*
Double parachute jump —two men on one chute	*180*
Fight on upper wing— two men, one man knocked off	*225*
Upside-down flying	*100*
Upside-down flying with man on landing gear	*150*
Delayed-opening jump —over 1,000 feet	*150*
Crash automobile into train	*150*
Head-on collision with automobiles	*250*
Ship goes down in spin to crash	*1200*
Ship spins down on fire (does not crash)	*50*
Blow ship up in mid-air, pilot 'chutes out	*1500*

Today when I look at (*Continued on page 46*)

HAT TRICK, Black Cat style, was performed at air shows all across nation. On wing skids were Spider Matlock and Fronty Nichols. On the ground passing up the hats were Paul Richter and famed racing pilot Art Goebel

Hot-Rod Helicopter

WHIRLING DERVISH—Flame pattern set up by Hiller's ramjet helicopter during night operations (*above*) caused one visitor to describe it as "infuriated palm tree on fire." Hands-off flight (*right*) is easy with the *Hornet*

By DONALD CHASE

WERE it not for a place called Korea, this little twin-engine ramjet helicopter might be parked in your garage today.

Stanley Hiller's new *Hornet* is probably the least complicated piece of flying machinery yet built. There are no moving parts in the two flame-throwing ramjet engines. There's no expensive gear-box and no heavy tail-rotor system. In fact, there's no tail rotor since there's no torque.

The whole two-place machine weighs only 340 pounds empty and was designed to sell for less than $5,000—even at today's inflated dollar.

"Actually, the ship is so simple to build that we could put the cost at $2500 or even less, once the research and engineering expense was written off," said 26-year-old Stanley Hiller.

The *Hornet* is tiny—tiny as the "and up" on a hotel rate sign. Total rotor span is only 23 feet and by turning the rotors at an angle, the ship can be parked in any garage.

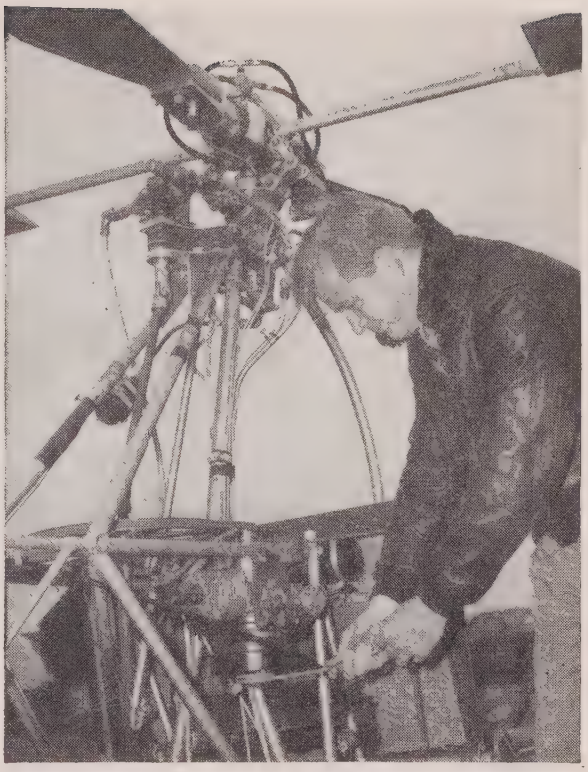
Hiller's *Hornet* is not a "quickie" flying test stand. Nearly two years of engineering work have gone into the jet engines alone while the ship itself has been completely thought through for mass production. Before current military orders shut-down

civilian production, 12 of these little jet jobs were run through a regular production line. The first two are now flying and the remainder will be assembled for a long-range test program. This makes the *Hornet* the first truly operational jet helicopter to be built on a production line.

Seventeen different basic designs were explored before the ramjet powerplant was finally selected. Experiments were made with gas turbines mounted in the fuselage with the exhaust gases piped to the tip of the rotor. Pulsejet engines were investigated, but the research crew finally settled on the ramjet powerplant as the most simple, trouble-free motor. In a ramjet engine there are no moving parts. Fuel is merely pumped into the combustion chamber where its ignition causes the thrust to drive the powerplant forward. It's just as simple as that. Because most ramjet experimentation had been for straight-and-level flight, Hiller's engineers were up against the relatively new problem of making a motor that would operate properly when twirled in a circle under a load of 1,000 g's. It took well over a year and a half to develop this 11-pound engine.

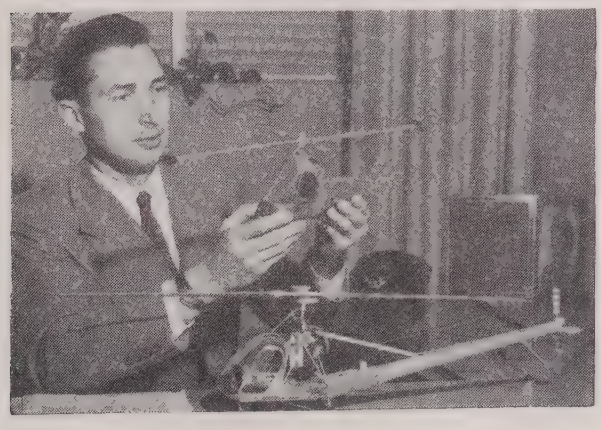
"That first ramjet engine was worth it's weight in gold," said Hiller. "It's just about the size and shape of a small watermelon, but it develops 31 pounds of thrust which is equivalent to 34 horsepower. Over 5,000 modifications were made to develop this little powerplant.

"A ramjet engine is the biggest gas hog in the world," Hiller added. "The powerplants on the present *Hornet* burn about 50 gallons of fuel per hour, but on the test stand we've already cut that consumption in half. The original units, in turn, burned 100 gallons per hour, so we're making progress. To off-set this high fuel consumption, it should be remembered that a ramjet will operate efficiently on just about any type of fuel. This engine runs equally well on 100 octane aircraft gas, low-grade auto fuel, kerosene, stove oil or what-have-you. We normally use 10¢-per-gallon heating oil in the engine so that our fuel cost per hour is (*Continued on page 50*)

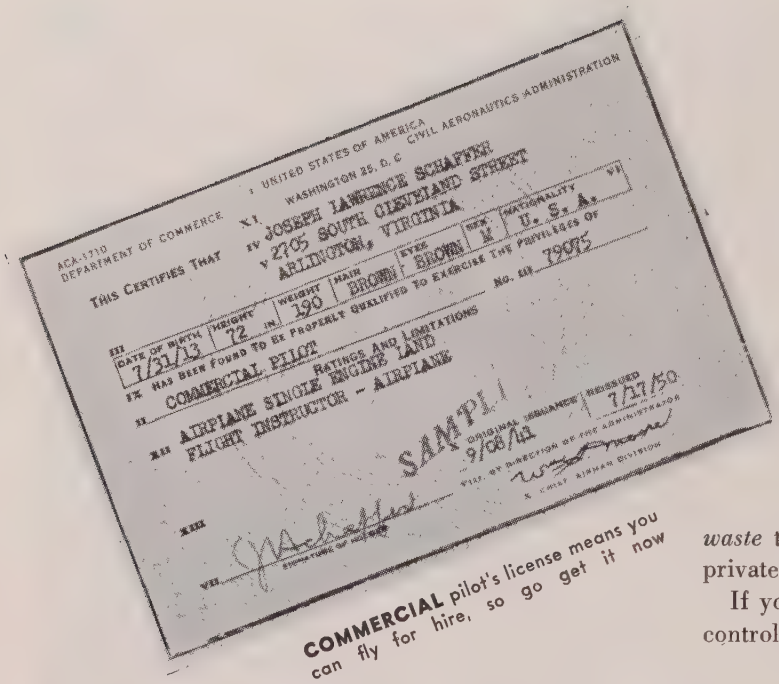


TEST PILOT Bruce Jones (*above*) starts small gasoline engine that begins rotation of rotor blades. Ramjets are lighted and begin to operate at full power as the rotor speed picks up. At 500 rpm, *Hornet* is ready to fly

DESIGNER Stanley Hiller holds model of the *Hornet* as he explains operation of the two-place ramjet helicopter



HORNET is shown here in two versions: cabin model and stripped-down version. Snap-on cabin weighs 20 pounds



COMMERCIAL pilot's license means you can fly for hire, so go get it now

Private license in hand, go after your Commercial ticket

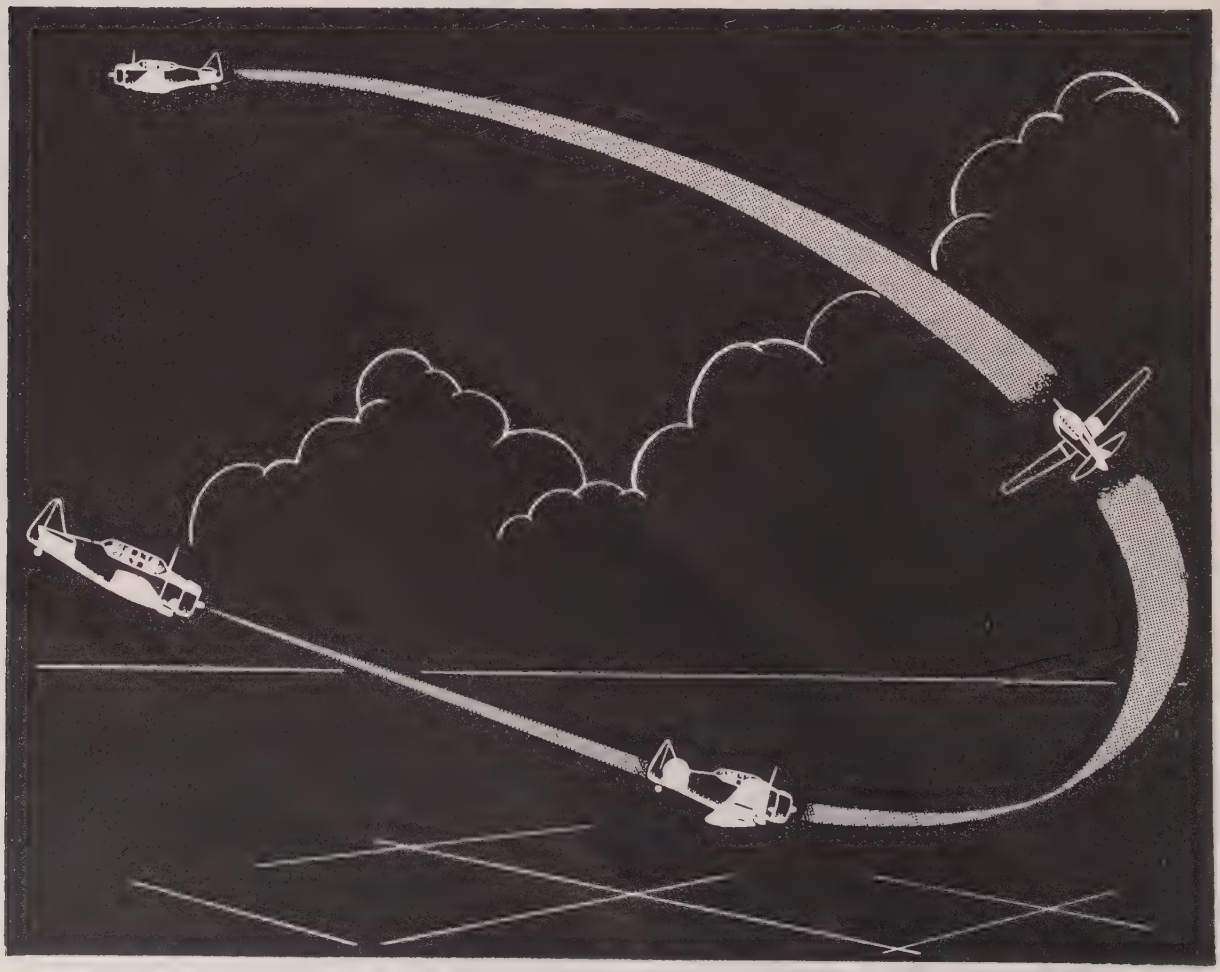
By BEN ROBIN

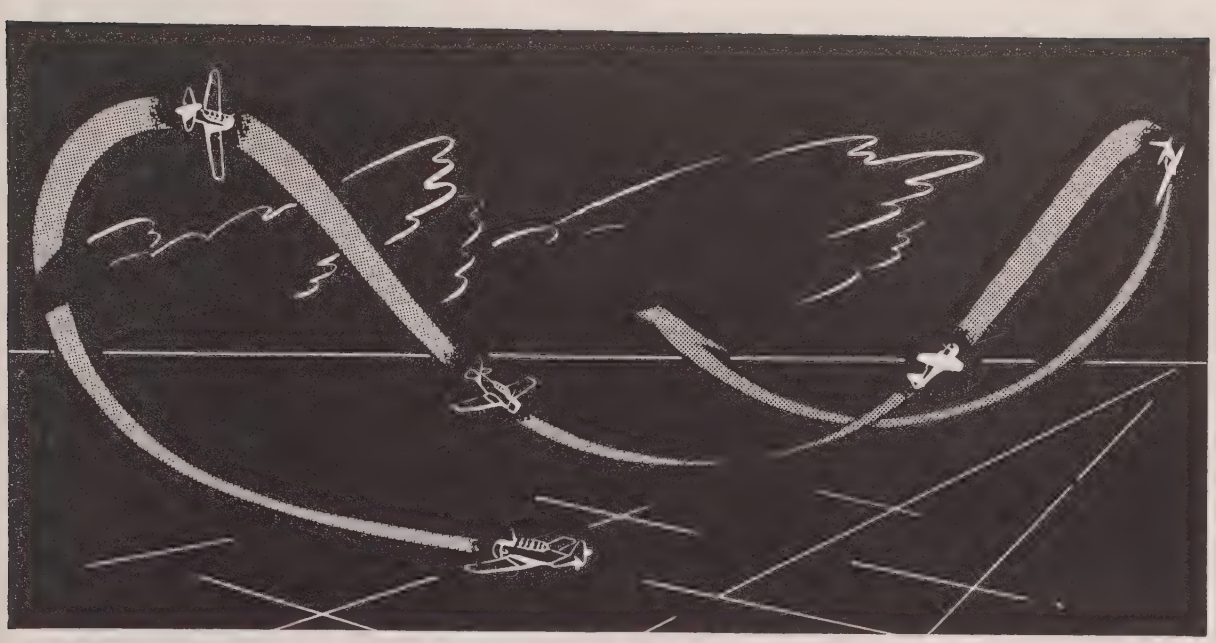
How To Get A Commercial Ticket

How would you like to turn in your private license for a ticket stamped COMMERCIAL PILOT? Would you like to enjoy the added prestige and earning power that is only experienced by the pilot who can fly for hire? I'm going to tell you how to get that commercial ticket—and get it easily. *Don't waste* the 165 hours of solo flying time between a private and commercial license.

If you didn't get your private pilot training in a controlled-course school, you probably had logged

PRECISION AIR WORK is the rule for a commercial license. Practice those Chandelles with power on and with power off





TRAINING MANEUVER par excellence is the Lazy Eight. Perform this one into the wind and use only one reference point

about 35 solo hours when you received your private license. Then the next five or 10 hours were spent in taking the girl friend for a ride over town. After that, the next 10 hours were spent flying cross-country to get that vile airport pattern taste out of your mouth. Gee! It felt good not to have to listen to an instructor or anyone else for awhile.

But sooner than you think there will be someone else to listen to. That someone will be yourself. You will no longer be content to shell out $8 or $10 an hour for flying time; you will want to fly for nothing, and even get paid for it like the other commercial pilots on your field.

If you have about 50 to 100 hours of solo time, you've already had that feeling. Now, here's where this article comes in. You can't spend the balance of your 200 hours of solo flight by carrying your gal friend and flying cross-country and still get a commerical license. You've got to practice.

Practice what, you ask? Didn't the CAA examiner say that your private-test spot landings were good enough for a commercial license? And weren't your spins exactly two turns, right on the money? They *were*—but are they now? And can you execute chandelles, lazy eights, and spins out of turns and with controls crossed? Then there's that little item called forced landings which wasn't counted on a private flight test, but it's gonna count this time.

The point that I wish to make clear is this. While it's fun to go joy riding to build up your solo time, that won't pass a commercial flight test for you. A CAA private examiner is told to check you mainly for safety during a private flight test. You won't fail if you don't make a safe, simulated forced landing. On a commercial flight check, however, you are expected to exhibit skill and judgment far beyond that required on a private-license test. It almost seems that the CAA doesn't mind if you break a friend's neck or your own, but when a customer pays, that's different.

So I suggest that if you plan to trade in that private license for a commercial, it's about time for you to start practicing.

Here are the things you will have to do before you can trade in that private ticket for a commercial.

First, you must get a *class two* physical exam; this must be renewed once each year. It isn't really much different from a private physical except that the doctor may have to get a waiver for you from Washington if you have any serious physical impairments. Most people who have a private physical can pass a class two physical easily.

Next, you will have to pass a written test that is really much harder than the simple CAR private written exam. This commercial test will include navigation, meteorology, civil air regulations, and aircraft and engine questions relating to the theory of flight. I suggest that you attend a certified ground school course if there is one available in your city. All approved flight schools run one, and you can inquire about the course at your local airport.

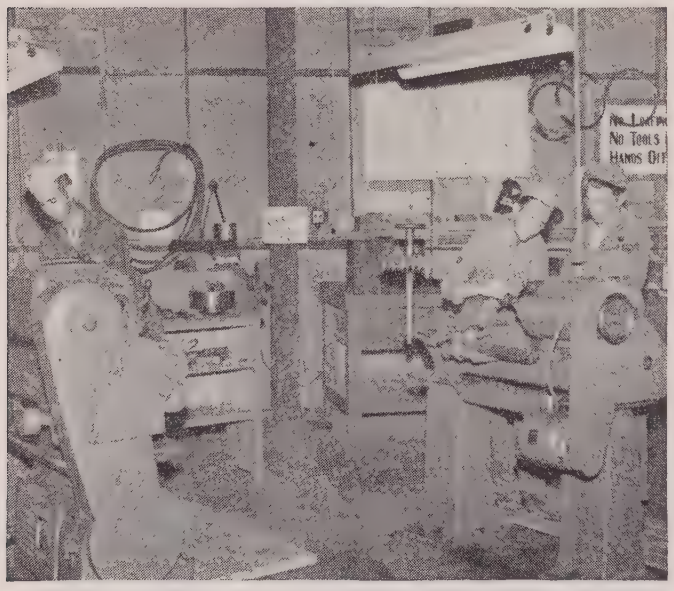
If you live a great distance from a large city or your work interferes with attending a formal school, you will have to study alone. While this is a harder way to learn, it doesn't present an impossible task.

Buy the government manuals, one on each of the required written subjects, study them and question the instructors and commercial pilots at your field on any of the really tough questions.

The navigation test will (*Continued on page 60*)

1st Air Force

RADIOMEN of 436th Troop Carrier Wing at Standiford Field in Louisville, Kentucky, test aircraft radio equipment



AIRMEN, also of 436th Troop Carrier Wing, get instruction in machine tool operation in aircraft repair shop

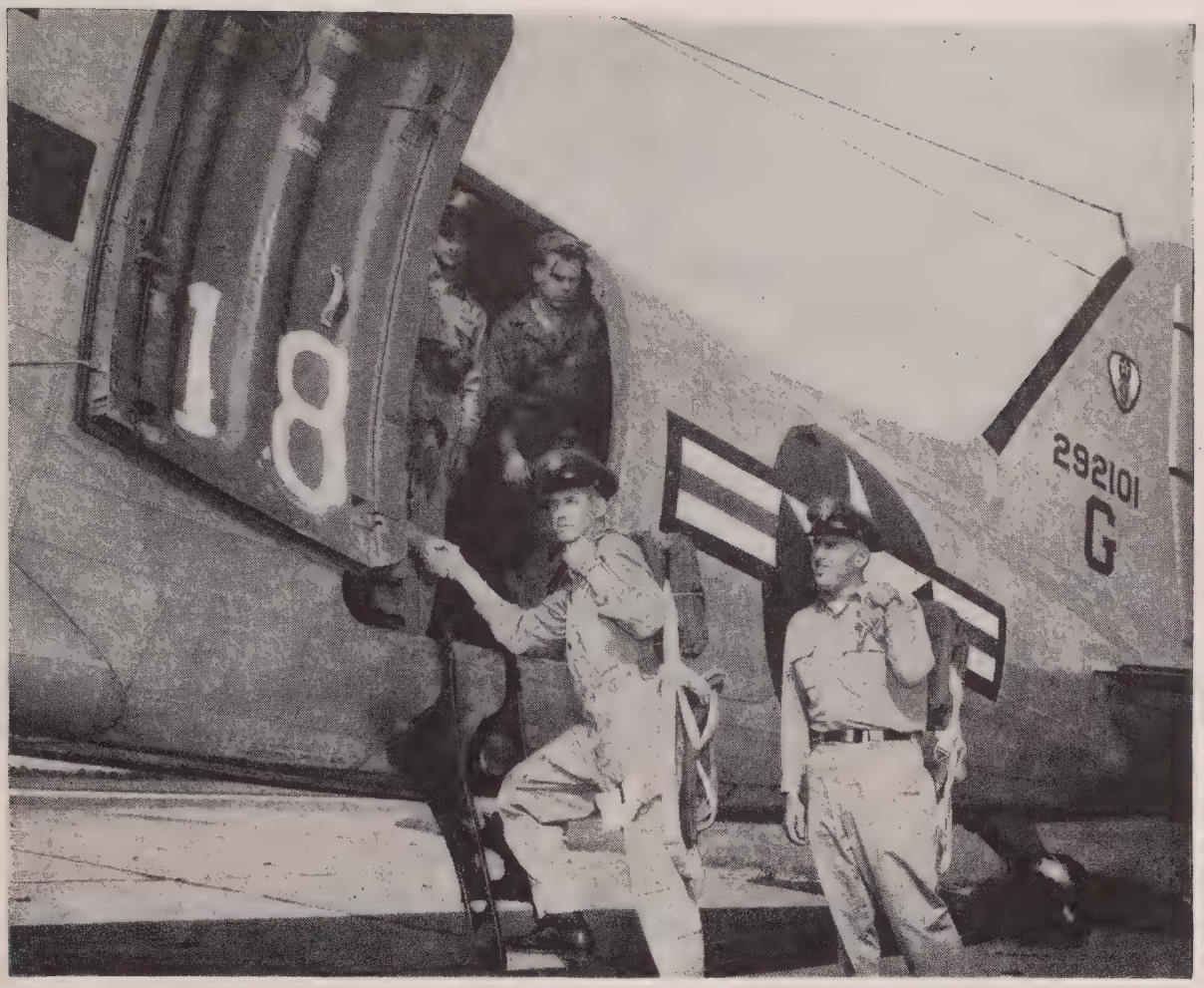
CADET TEAM *(left to right)* Lt. Chandler, Maj. Stines, and Lt. Weber, visits colleges to test AF applicants

By COL. N. F. SILSBEE

1st Air Force spearheads AF expansion by supplying trained personnel

In order for the Air Force to handle its share of world responsibilities, events have caused AF Secretary Thomas Finletter to up his estimate of a 70-Group Air Force, contained in his 1948 Presidential Commission Report, to 100 groups and 971,000 officers and airmen. One organization which will supply the thousands of traincd and experienced personnel to the expanded USAF is the 1st Air Force, which has its headquarters at Mitchel Air Force Base, Hempstead, N. Y.

The mission of the 1st Air Force is supervision of the training and operation of the Air Force Reserve, the Air Force ROTC, and the Air National Guard and the Civil Air Patrol in an area which includes 15 Northeastern states and the District of Columbia. The 1st Air Force also cooperates with



OFFICERS and airmen of 436th Troop Carrier Wing, based at Standiford Field, Kentucky, climb aboard a C-47 preparatory to take-off on training mission. Week-end missions keep airmen's flying ability at a top level

the nationwide Explorer program of the Boy Scouts of America.

The First's area of responsibility consists of the states of Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Ohio, Maryland, West Virginia, Kentucky and the District of Columbia.

The commanding General of the 1st Air Force is 57-year old Major Willis H. Hale, commander of "Hale's Handful" in early 1942, the outfit which later became the far-ranging Pacific-island hopping Seventh Air Force. Hale was then one of the small group of Army Air Corps officers who saw the strategic importance of air power, having been Inspector of Major General Frank M. Andrews' GHQ Air Force at Langley Field in the late 1930's. Since the reorganization of the Continental Air Command which resulted in setting up the Air Defense Command as a top-level command under Lt. General Ennis C. Whitehead, and which brought back Lt. General John K. Cannon from Germany to head up the newly activated Tactical Air Command, General Hale has worn a second hat—CG of Continental Air Command as well as First Air Force. ConAC, through its four numbered air forces (including the First), has been able to carry out the USAF Reserve Forces program throughout the nation more effectively as a result of its recent reorganization.

COMMANDING GENERAL of ConAC (Continental Air Command) and also 1st Air Force is Maj. Gen. Willis H. Hale

Under the First are five Air Force Reserve Training Centers, manned by Regular USAF personnel. These are:

2230th AFRTC—Colonel Richard W. Phillips, Command- (*Continued on page 48*)

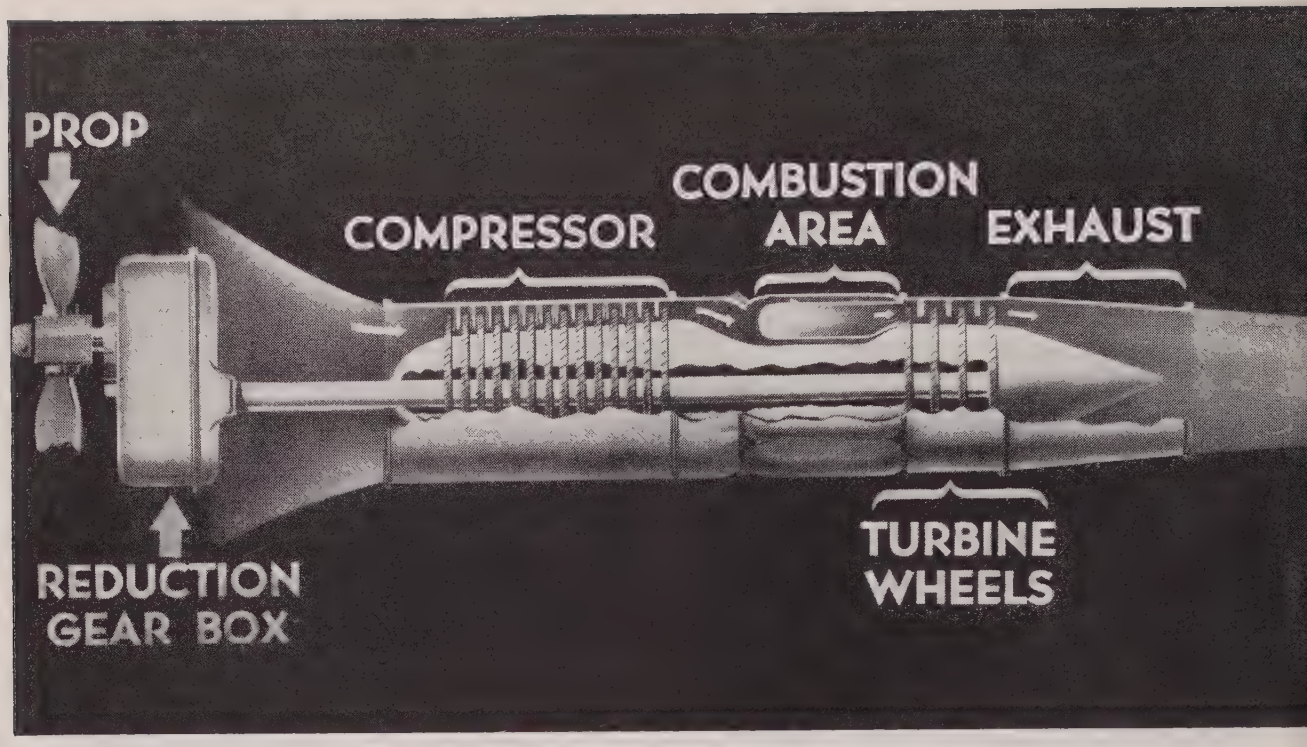


DIAGRAM shows how turbine is connected through drive shaft and reduction gears to a special type Aeroproducts prop

Convair Liner

Turboprop version of the Convair-Liner makes its initial flight in California

THE U.S.' first turboprop transport, the Convair-*Turboliner*, recently made its initial flight at San Diego, California, home base of Consolidated Vultee Aircraft Corporation. Powered by two 2,750-hp Allison turboprop engines, the Convair-*Turboliner* has an average cruising airspeed of 310 mph, a gross weight of 41,790 pounds.

A development of the 40-passenger Convair-Liner, the *Turboliner* is a cargo version, with eight airliner-type seats in the forward section, the remaining section arranged for cargo. This first model is strictly a research transport ordered by Allison to test their gas turbine engines, and developed under sponsorship of the U.S. Navy.

The Allison 501 turboprop engine is the commercial version of the T38 turboprop engine developed for the Navy's U.S. Bureau of Aeronautics. This engine produces more than twice as much power for each pound of weight than reciprocating engines now powering transport aircraft. Rated at 2,750-hp at take-off, each Model 501 engine weighs about 1,250 pounds. They replace 2400-hp piston engines.

A single shaft connects the multi-stage axial compressor and the four-stage turbine in the 501. This shaft is rotated at very high speeds by exhaust gases from eight combustion chambers pushing against the blades of the turbine wheels. The rotating shaft not only operates engine accessories and the compressor but it drives a four-bladed Aeroproducts propeller for the primary propulsive thrust of the engine. About 10 per cent additional thrust is obtained from the unused exhaust gas escaping from the tailpipe.

A low-pressure pneumatic self-starting system developed by AiResearch Manufacturing Co., is installed in the Convair-*Turboliner* to make the plane the first turboprop airliner capable of continuous operation without ground starting power. This self-starting system is operated by a push-button on the instrument panel.

The *Turboliner's* fuselage is a pressurized section with three compartments for crew, passengers, and

FIRST U.S. TURBOPROP TRANSPORT, the Convair-*Turboliner,* is shown here on its first take-off at San Diego, Calif.

cargo. Length of the fuselage is 74 feet 8 inches, and diameter is 9 feet 5 inches. A self-contained entrance stairway is located on the right side of the fuselage, forward of the wing.

The dual-wheeled tricycle landing gear is hydraulically operated with the main gear swinging forward into engine nacelles, and the nose gear into the fuselage. An auxiliary method of lowering the gear with compressed air is provided in case the hydraulic system becomes inoperative. The main tire size is 34 x 9.9, the nose gear size is 7.50 x 14. Tread is 25 feet.

Wing and tail surfaces are protected against icing by a thermal anti-icing system.

The Convair-*Turboliner* has a wing span of 91 feet 9 inches, and a wing area of 817 square feet. It has a flap span of 26 feet 8 inches; and a total span area of 140 square feet.

The plane's spacious flight deck is pilot-designed. Directly in front of the pilot is the main instrument panel; dual flight instruments are located in front of the co-pilot. Engine instruments are mounted in center between two main panels.

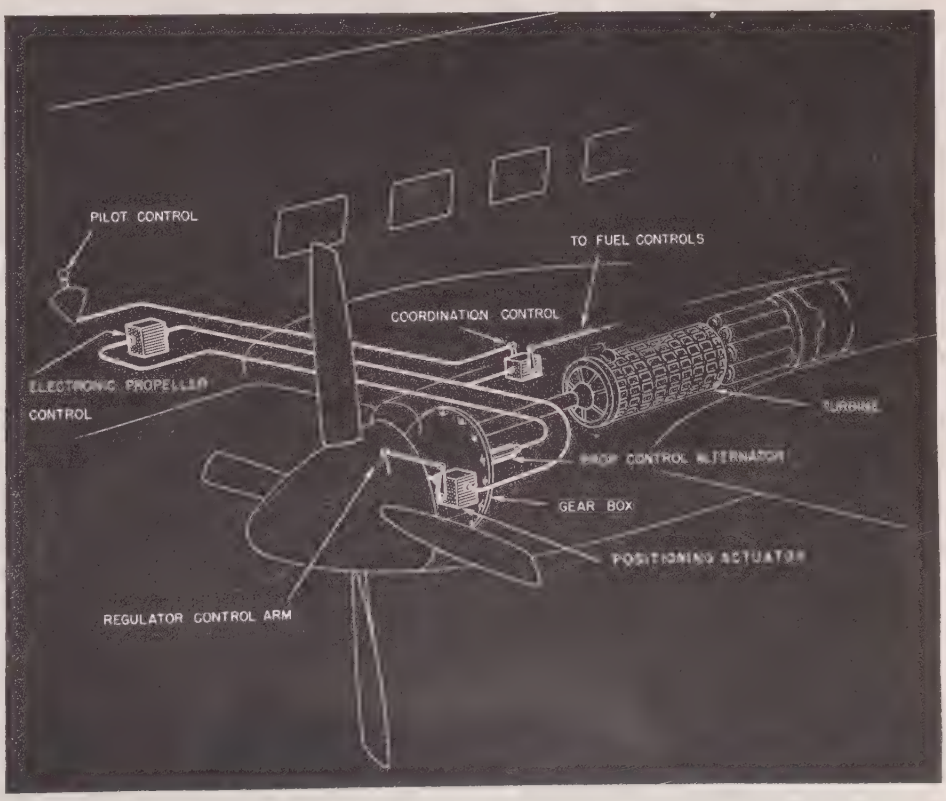


DIAGRAM shows linkage between Aeroproducts prop and turbine. Prop converts turbine horsepower into driving thrust, and acts as turbine governor

"Dim-wit Dilbert's budding ground loop goes full bloom before he snips it!"

DILBERT

By S. H. Warner and R. Osborn

Don't Mistake Sniffs For Snifters—If you saw a red-faced guy muttering to himself and staggering down the street, you probably would assume said fellow was intoxicated. You might be right, and then again you mightn't. For instance:

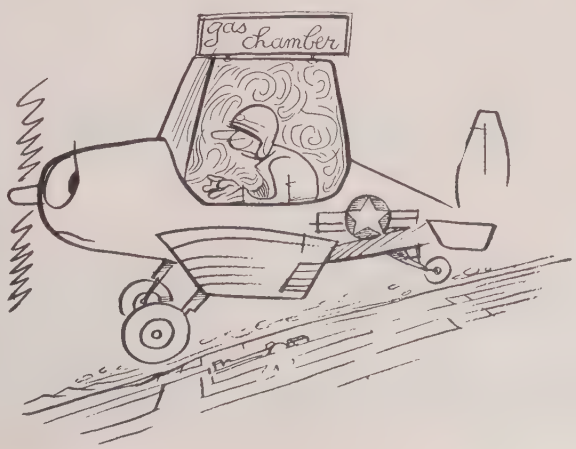
Upon returning from a three-hour flight recently, a military pilot landed smack in the midst of heavy traffic, without ever having contacted the tower by radio. He taxied up to the line and staggered away.

They don't like this sort of thing in the Service, so they soon had the offending pilot under guard and rushed him to the Dispensary for medical examination for alcoholic intoxication. Examination revealed that his face was flushed, speech was thick and slurred, appearance unkempt, gait shuffling and unsteady, and coordination poor. He had all the symptoms.

To complete the case against the offender, blood was drawn for a "Bogen's" test, which shows the alcoholic content of the blood. At this point, the intoxication charge quickly fell apart. This irrefutable test showed there was *no* alcohol in the blood.

Noting the pilot's mottled, red face, one of the examining surgeons next carried out a qualitative test for carbon monoxide in the blood. This test was positive, revealing a carbon monoxide saturation of almost 25 per cent.

A check of the plane revealed a loose bracket on the exhaust collecting ring, which had allowed the ring to vibrate loose. This in turn permitted escape of the engine exhaust directly from the cylinders into the engine compartment, and thence through fitting openings in the firewall, directly into the cockpit.



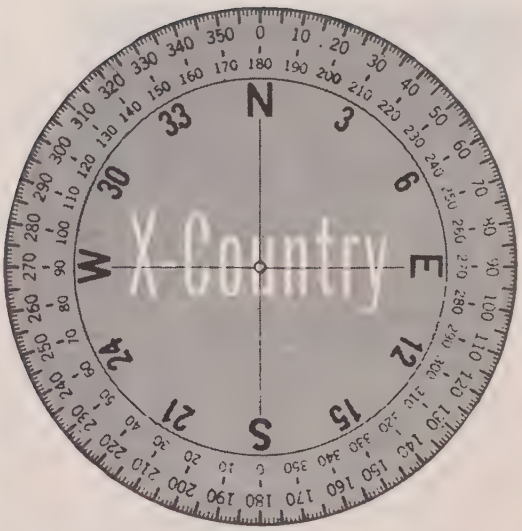
A review of this "almost" accident shows: 1. The physical symptoms of carbon monoxide poisoning and alcoholic intoxication are very similar; and 2. In the air, there is little to choose between them; either poison in the blood produces a Dilbert mentality and presents a high accident potential; but 3. On the ground,

(*Continued on page 54*)

THUNDERJETS return from Korean air battle against Soviet-made MIG-15's in which three MIG's were shot down over Yalu River

FOUGA CYCLOPE is latest in series of jet lightplanes. This one is aerobatic version of *Sylphe:* has shorter wing span, new gear

FAIREY 17 is British anti-submarine plane powered by *Double Mamba* twin co-axial turbine engine driving contra-rotating props



NAVY 'COPTER, newest in the Air Navy hangar, is this Piasecki HUP-1, pictured here making its first service flight as pilots of HU-2 Helicopter Squadron, NAS, Lakehurst, N. J., get checked out in the high-performing shipboard 'copter. A large number of Piasecki HUP's are on order for fleet use; are being built at Morton, Pa.

TEXAS RANGERS now have sky-eyes. The Rangers, fabled in fact and fiction for many years, have now taken to riding the skies as well as the ranges of Texas. The Bell helicopter is a new breed for the horse-riding Rangers. Here Clint Peoples in the 'copter passes to Ranger Stone a rough map of stray herds spotted from the air

CHIPMUNK, designed and built by De Havilland Aircraft of Canada, is being supplied to the Royal Canadian Flying Clubs for reserve officer training. Thirty-seven of these trainers will go to the clubs. It is powered by 145-hp *Gipsy Major* engine, has a top speed of 143 mph, and a cruising speed of over 127 mph

CAOA REPORT . .

CORPORATION AIRCRAFT OWNERS ASSOCIATION, INC.

Corporation Aircraft Owners Association is a non-profit organization designed to promote the aviation interests of the member firms, to protect those interests from discriminating legislation by Federal, State or Municipal agencies, to enable corporation aircraft owners to be represented as a united front in all matters where organized action is necessary to bring about improvements in aircraft equipment and service, and to further the cause of safety and economy of operation. The CAOA headquarters are located at 444 Madison Avenue, New York 22, N. Y.

Headquarters to Washington

At the January meeting of CAOA's Board of Directors the decision was made to shift CAOA's national headquarters from New York to Washington. This move has been under consideration for some time as one calculated to result in more effective service to our members. The greatly increased expense of such a move, involving full-time service from the executive secretary, adequate office space and clerical help, etc. has held up the decision until the present time.

A letter was received from Donald W. Nyrop, Administrator of Civil Aeronautics, stating that the CAA was looking to the Corporation Aircraft Owners Association to handle the vital matter of aircraft parts, supplies and equipment for not only CAOA members but for the entire group of companies operating aircaft for business, as far as this may be possible.

The letter also suggested it might be advisable to move the headquarters to Washington, not only to work more closely with CAA on the parts and supplies problem, but that under present emergency conditions many other things will be coming up in the immediate future affecting non-airline civil flying.

The Directors felt that the Association should proceed in faith to make the shift, with the expectation that the greatly increased service which would be possible in Washington would attract many more members, thus providing for the increased expense.

An offer from the Aeronautical Training Society to sub-let office space at 1025 Connecticut Avenue, N.W., Washington 6, D.C. was accepted, to begin March 1st. By the time this issue of SKYWAYS is in your hands the transfer will have been made, and the CAOA national headquarters will be in operation at the above address.

It is hoped that member-company officials and pilots, and those of all companies operating aircraft will check in during a trip to Washington, which trips, incidentally, bid fair to increase in frequency during the coming months.

Task Group "C"

Maxwell W. Balfour, Vice President of Spartan Aero (Tulsa) is Chairman of Task Group "C" on Maintenance and Overhaul on Mr. Rentzel's Civil Aviation Mobilization Task Force which was set up in October under the National Security Resources Board.

Since the first of the year Capt. Balfour has been putting some time in Washington, meeting from time to time with members of his Task Group and the appropriate government agencies. His report to Del Rentzel and reports from all Task Groups will be worked into a main report to Mr. Symington which is expected to set the policies on civil aviation during the period of the emergency.

The CAOA has been asked to present to Task Group "C" figures and recommendations relating to company-operated aircraft, including total numbers of aircraft and engines by makes and models, total hours of utilization, etc. This compilation is in progress as we go to press.

Priorities for Civil Aviation

CAA has set up an Office of Aviation Defense Requirements to administer priorities and allocations for civil aviation. The office is headed by G. R. (Ray) Gaillard, who has been CAA Standardization Coordinator.

The immediate responsibility of the Office of Aviation Defense Requirements will be to handle "DO" (Defense Order) rated orders for new air-carrier aircraft and for necessary spare parts and equipment to keep U. S. and allied foreign carriers in operation.

So much was announced, but a phone call to Colonel Gaillard brought the information that his office was also working on the non-airline civil-aircraft parts and supplies problem. He said he was looking forward to working very closely with CAOA as soon as the CAOA transfer to Washington had become effective.

He is now making plans for the necessary staff to carry out his assigned function. His office at the CAA is Room 1607, T-4 Washington 25, D. C. Phone Sterling 9200, Extension 3487.

In a recent address Don Nyrop briefly described the functions and scope of the Office of Aviation Defense Requirements. He pointed out that the CAA is "claimant agent" for materials parts and equipment for both air carriers and non-air carriers; new aircraft required by other than air cariers; and equipment for the Federal Airways System.

For non-airline needs, the CAA "submits a list of approved requests to our Office of Aviation Defense Requirements. Ray Gaillard has a wealth of experience in this type of work from World War II, in which he served as an Air Force colonel assigned to the Aeronautical Board. If you have any problems involving aviation materials needed for defense purposes, I know that you will receive courteous and competent handling.

"Although we do not yet have the funds assigned to staff this office, our tentative plans call for a total of about 100 people in Washington and the regions.

"Upon our regions will fall the responsibility for screening the requests of the great number and variety of non-air carrier operators They will call upon advisory panels from the industry to assist in setting fair standards for measuring the relative importance to defense of various flying operations and for establishing the legitimate supply requirements of such operations.

"At one time, concern was expressed that CAA would not have the staff to handle the civil-aviation phase of defense production and procurement with the necessary speed. I feel confident that the office we are setting up for this purpose, although operating with a minimum number of people, will be able to accomplish its mission by proper delegation of authority."

New Members

The following companies have been accepted as regular members of the Corporation Aircraft Owners Association.

Noland Company, Inc. of Newport News, Va. are manufacturers of wholesale plumbing and heating, electrical, refrigeration and industrial supplies. The company has been flying aircraft in connection with their business since 1929. Present equipment is a Beech D-18S; H. A. Leamon is chief pilot.

The Hoover Company, North Canton, Ohio. This well-known maker of vacuum cleaners and other electrical appliances, fractional horsepower motors and commercial castings has acquired its first company plane—a Beechcraft D-18S. Chief pilot is Marshall V. McDowell (ATR).

Ballenger Paving Company of Greenville, S. C., contractors, also operates a Twin Beech, averaging about 50 hours per month. Company president is C. P. Ballenger, Jr., and C. H. Von Hollen, Jr. (ATR) is pilot.

Food Machinery & Chemical Corporation, of San Jose, Calif. operates a Douglas B-23 which has the speed and range for the frequent trips from home factory to the New York office. The company also operates a Beechcraft D-18S. Richard W. Lane (ATR) is the chief pilot; E. B. Doerksen is co-pilot-mechanic on the B-23, and Donald H. Rude on the Twin Beech.

Subcommittee on Airways

Cole H. Morrow of J. I. Case Company, who is chairman of CAOA's Technical Committee, is a member of NSRB Task Group "D" on Airways and Air Traffic Control. He represents the interests of all operators of company aircraft, and in this connection has made several trips to Washington to take part in the discussions.

Mr. Morrow also is working closely with the very important ACC NAV Panel's Operational Policy Group, representing company flying interests (see *Navicom* section).

Civil Aviation Defense Councils

Norman L. (Bud) Mitchell, chief pilot of CAOA member S. J. Groves & Sons Company, informs us that he has been asked to serve on the Minnesota Civil Aviation Defense Council, representing company-operated planes and pilots within the state.

PLANE FAX

Quick picture of

KERN COUNTY AIRPORT

Bakersfield, California

First county airport in U.S. . . . 14,000 private planes visit here yearly . . . jeep to handle passengers, gear . . . 96% flying days a year . . . 24-hour mobile service truck—with Standard Oil products and service, including Chevron gas and RPM oil and lubricants.

Get ready for Spring flying!

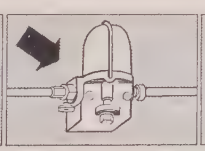
Inspect these key points...

heck the external radio antenna for corrosion, rust . . . d the fabric for ringworms (these are warning spots)!

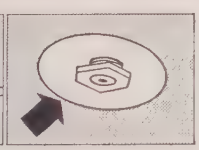
Be sure your fuel system is clean

hen you first start flying after a winter layover, you y run into serious trouble—like an engine stoppage take-off—unless you do three things.

rst: clean the rburetor screen dirt, impurities.



Second: drain and clean out the sediment bowl.



Third: drain the main sumps on the fuel tanks.

nd when you refuel, ask for Chevron 80/87 Gasoline . the anti-knock gas that can give you more powerful ke-offs than you've ever known with ordinary 80- tane fuels. It's thrifty, too—costs less than 91/98.

TIP OF THE MONTH

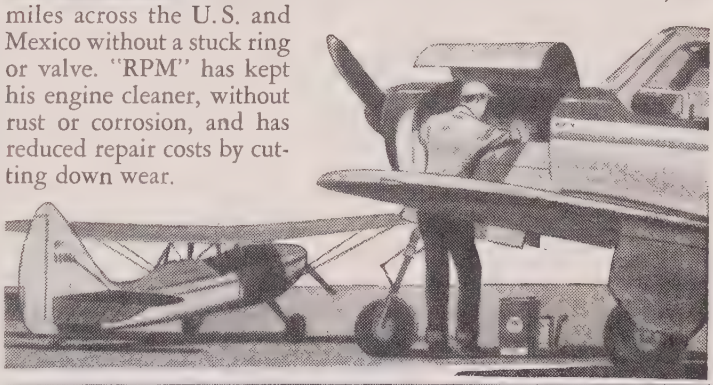
Drain water out of wings

s amazing how many fabric-wood and plywood planes e junked simply because water has collected inside the ngs and fuselage, and rotted the wood. Reason: drain- e holes have a tendency to stop up. So it's vital that u make sure holes are clear, and all water is out.

Roy H. Pemberton, owner, Pemberton Flying Service

Change to summer oil

When warm weather comes drain out your old winter oil and put in clean, fresh summer oil. For extra engine protection, use only RPM Aviation Oil. Roy Pemberton of the airport's Pemberton Flying Service reports that he used "RPM" in his Beechcraft Bonanza for 120,320 miles across the U.S. and Mexico without a stuck ring or valve. "RPM" has kept his engine cleaner, without rust or corrosion, and has reduced repair costs by cutting down wear.



CHEVRON AVIATION GASOLINE

RPM AVIATION OIL

Standard Oil Company of California

Forced Landing

(*Continued from page 13*)

the morning to fly a trip that could last anywhere from eight to 24 hours.

Since fuel at the north end of the route is not available except for emergencies, outbound planes have to carry a round-trip supply of gas. And since the cargo in the ships is vitally important, most pilots stretch a point here and there for the sake of the job and safety and take off with a couple of hundred gallons of gas that don't seem to get on the manifests somehow with the big Douglas transports limited to 70,000 gross.

Because the up-north terrain could hardly be called mountainous, all instrument letdowns are flown using a homing broadcasting station and the ADF. Low ceilings and worse visibility usually gives the pilots the impression that a dirty white sheet is draped around the cockpit windows while they are shooting a low approach.

Navigators are used on all flights because of very limited radio facilities and the absence of permanent landmarks. Dead reckoning is S.O.P.

It was 0400 in the dead of winter when Lt. Franklin Seibert started the flight that led to a dead-stick landing.

His crew consisted of Co-pilot Lt. W. R. Roe, Navigator Lt. T. Parson, Engineer Staff Sgt. Keesling and Radio Operator Staff Sgt. Bowers. Their take-off was Edmonton, Alberta, Canada; their destination approximately 1,000 miles north.

Northbound, all navigational instruments were checked and cross-checked as usual and the trip was uneventful. While the whole crew pitched in to unload the cargo before the engines froze up in the sub-sub zero temperatures, time was taken to "stick" all the gas tanks and ascertain as closely as possible the fuel consumption northbound and gas remaining for the trip back.

Everything was par for the course, including an abrupt change from CAVU to instruments at the time of take-off. This made dead reckoning a gamble on wind drift and was promptly followed by static that blocked out all radio reception. Just little things—all S.O.P. up in the north country.

S.O.P., too, were the practically inoperative gas tank gages, which minor annoyance is circumvented in flying with a high priority by a standard procedure of running on "AUX" tanks until dry. Strictly S.O.P.—you don't repair electronic gadgets in 60 below zero on the polar ice cap when you are short of airplanes, men and time.

But it added another little trouble. The boys had no way of checking gas consumption accurately from hour to hour in flight, as they had no way of checking wind drift for dead-reckoning navigation on instruments.

So, when something happened to Number One engine that threw gas consumption from a normal 200 gallons per hour up to the critical point of 450 gallons an hour, with 250 gallons going overboard hourly, it was three hours before the crew got its first warning. The Number One main fuel tank gage suddenly came to life for a change and indicated 200 gallons less than should have been in the tank. Meanwhile, the boys already knew of navigational difficulties when they failed to pick up the one lone radio range located about half way between Cambridge Bay and Edmonton, Canada.

They were still on instruments and static made reception of any sort impossible, although they tried all bands.

The crew quickly figured the fuel still available, the distance to go if the plane was anywhere near on course, and the consumption of gas now expected. From that the boys arrived at an estimated landing at Edmonton *sans* gasoline.

In six years of flying the Alcan, the lanky, blond, good-natured Seibert, who is rated by the crew chiefs as "the best damn pilot I ever flew with" had never hit any combination of circumstances quite like this one.

It was another hour before they broke out of the weather and found a couple of prominent but unfamiliar landmarks.

Radio reception improved and they got one faint range signal which they finally identified as The Pas (pronounced L'PAH), located in a vast region of lakes far off-course north and east of Edmonton.

At this time they figured 45 minutes of flight left, and received information from The Pas that the lakes were all shallow, with 12 inches of snow on top of the ice.

STRAIGHT DOWN—This unusual photo was taken as pilot of *Meteor* put his jet fighter into a dive. The RAF *Meteor* carries eight rockets

It was impossible to learn where the gas was going until it was too late to do anything about it.

When the gages, such as were available, indicated 50 gallons left, the boys knew they couldn't make The Pas and began flying from lake to lake, these being the only possible landing sites available.

By good fortune, the only lake with a name came up in recognizable form just as Number One engine ran out of fuel and they feathered the prop. Sgt. Bowers reported their position and in 30 seconds Number Three was done and the prop feathered. Numbers Two and Four followed quickly, but the ship had trimmed out beautifully by now and "Si" could see that he was in no danger of undershooting Reed Lake.

He made a decision quickly. Bellied in, the big ship was as good as junked, and with Korea demanding every spare C-54 the world around, MATS couldn't spare a sing plane.

Therefore, Seibert didn't feather two an four, but kept them windmilling as an i board was necessary to maintain syste pressure in the hydraulic lines.

He trimmed the big Douglas out at 14 Indicated and found that it handled pe fectly with a good gliding angle and e cellent control. A base leg was establishe the turn on final "was just like flying *Cub*" and the fairly shallow angle was relief as it offered the boys a chance save the plane.

Seibert is thankful now for the great stre that MATS operations officers place on co tinued flight proficiency checks, and th assignment of experienced personnel critical flight missions. Every man knew h job and did it systematically and with max mum efficiency.

They dropped 15° of flaps, cut all switche shot the gear down into place as they flare over the edge of the lake and settled soft and with almost eerie silence into the cus ioning snow. They put the ladder down an crawled thankfully out into the snow-covere Canadian wilderness.

Luckily, Radioman Staff Sgt. Bowers ha been able to send out an exact position r port and an hour later, at 1200 noon, civilian, twin-engined Avro *Anson* lande on skis to pick them up. It was then t boys learned that their field was only 4 miles away!

A few hours later, Seibert, Roe and Eng neer Keesling flew back out to MATS 559 with 200 Canadian gallons of 90 octane ga in four drums. These had to be drained h a hand pump and strained carefully becaus of impurities and ice particles that forme while gassing.

In spite of the intense cold, all four engine started easily and Seibert started his fir take-off attempt. He held brakes until pow was fully on and then let her roll. The plan accelerated to 80 mph with surprising swif ness, but in 15 inches of snow it wouldn quite haul out even with 20° of flaps poppe and both pilots hauling back on the stic

At the end of the lake they turned aroun and gave it another whirl. This time at 8 Indicated Seibert had the engineer slam th superchargers into high blower to boost th manifold pressure over 52 inches and, wit both pilots exerting as much back pressu as possible, the plane heaved out and can airborne in a hurry.

The rest was S.O.P. again. At The Pas a inspection revealed a loose fuel line in th Number One engine accessory section. O viously, they had shut it down and feathere the prop after take-off for the 20 minu run to The Pas. It then took about tw minutes to make repairs and two hours o the hand pump to fuel the plane, and couple of hours to get home, check in, an shave.

Looking back on it, Seibert reflects th the day's experiences included four fair consoling factors—the fact that it was da light, the smoothness of the lake ice, th little extra reserve of gas that got them the lake country, and the fact that in spi of lost fuel, no radio reception and bein lost due to weather, they were able to rea Edmonton before the bar closed at th Officer's Club.

They figured they owed themselves drink!

BREAKING HER OWN WORLD RECORDS

The Air Force's Convair-built XC-99 transport, with no more world cargo marks to break except her own, continues to set new records that no other aircraft can approach.

The conflict in Korea has proved conclusively that battles and even a major campaign can be lost if critical materials are not available immediately after an aggressor strikes.

Commitments by the United Nations to stop aggression throughout the world emphasize the desperate need for high-capacity, long-range air-cargo-carriers that can transport vast amounts of materiel where and when they are needed.

Only the C-99 can speed more than 100,000 pounds of weapons or supplies anywhere in the world in time to meet the initial thrust of an aggressor.

IN THE AIR — IT'S **CONVAIR**®

CONSOLIDATED VULTEE AIRCRAFT CORPORATION
SAN DIEGO, CALIFORNIA FORT WORTH, TEXAS

Fighters vs. Bombers

(*Continued from page 12*)

On the basis of this early information, bomber pilots calculated for themselves a safe position in the speed spectrum. For example, a fast jet bomber in the B-47 or *Canberra* class might cruise along at a high-subsonic speed until an enemy fighter is encountered. Once the enemy is sighted, however, the bomber pilot proposes to pour on the coal and hit a speed just below compressibility. There he would stay, on the verge of the taboo region, thumbing his plexiglas nose at the would-be interceptor.

If the fighter happened to be *behind* the bomber in the initial phase of the engagement, so the foxhole theory goes, the fighter would have to enter the transonic region and stay there in order to close in. If the fighter pilot chose to stay below the red line on his Machmeter, the enemy could simply proceed to the target and unload with perfect immunity. This would be enough to drive any fighter pilot batty.

When the writer expounded this theory at a meeting at the Otis Air Force Base, the audience, made up solely of seasoned blowtorch fighter pilots, reacted violently. They brought up such facts as new fighter designs that could approach the speed of sound more closely without running into compressibility, and that the so-called barrier could be pierced with a transonic fighter like the F-86 without having the pilot jarred unduly during the process. At the end of the argument, it was decided to investigate both sides of the dilemma.

In aerial warfare, successful defense against air invasion stems from unity of medium; the place to fight the airplane being in the air. During the last war, both sides developed excellent ground defenses against aircraft, *i.e.*, radar, super-accurate flak artillery with proximity fusing, as well as seeker rockets against low-level attacks. Yet experience proved that enemy penetration was possible despite the costly ground set-up. In fact, the experience proved that without a protecting fighter force, most of the major air victories would have been impossible.

Actually, the superiority of air-to-air rather than ground-to-air has a psychological origin. In facing the enemy, man strives for freedom of action; instinctively he knows that the more freedom he has, the better chance exists for victory. A fighter pilot has that freedom, since he can maneuver his plane in three dimensions. On the other hand, the anti-aircraft gunner is limited strictly in choice of action and space and is, therefore, apt to develop a feeling of inferiority. Interviews with ack-ack gunners and fighter pilots participating in the Battle of Britain showed a marked difference in the attitudes of these two classes of fighting men who were dedicated to doing the same job with different types of equipment. This marked difference in attitude is the epitome of that "human element" that is the pay-off in combat.

Discussing the matter of high-speed interception with that most cooperative and hospitable group, the pilots of the 33rd Fighter Wing at Otis AFB, we decided to plan the study, taking into major consideration these human limitations.

In working out the interception problem, the major limiting factor was that of centrifugal force—g, that incredible product of inertia that drains the blood from the pilot's brain, and produces blackout. For that reason, we designed the interception maneuvers for a maximum of 2 g's, a pull that can be endured by the trained fighter pilot for many seconds without blacking out.

Mock interception runs soon proved the basic idea workable, provided we had good radar coverage for our frontier and radar operators trained to "fly" the problem at their scopes in close co-ordination with the interceptor pilots.

Let us then assume that we have these two basic requirements, and see how we can do when the chips are down.

There are two approaches to the problem at the present juncture. The first is in a purely subsonic fighter, like the F-84 or the Grumman *Panther* fighters that pack a healthy punch and have a moderate range. The second approach to the problem is in a fighter capable of crossing the sonic barrier and operating above Mach 1. The McDonnell F-88 is reported to be a candidate for such a task.

With the subsonic fighter, it is obvious that the interceptor must stay *below* compressibility at all times. Consequently, his speed will remain roughly that of the invading bomber. This situation eliminates all dead-stern attacks, and reduces the effectiveness of any but head-on and head-quartering attacks. While the stern attack is ideal for the fighter-pilot's gunnery, it is equally good for the tailgunner on the bomber, a fact that discouraged even the stubborn German fighter pilots of World War II. If we are forced to attack a fast subsonic jet bomber (a four-jet IL-16, for example) with a subsonic jet fighter such as an F-80 or F-84, we would have little choice but to use the deadly and difficult frontal attack.

Both the enemy and the interceptor are plotted by our radar. This plotting must be done at the shortest possible intervals and with high accuracy. According to the radar data now available, the PPI (Plan Position Indicator) antenna completes one 360° sweep every 10 to 12 seconds, which means that every 10 or 12 seconds a new set of plots will appear on the scope. A skilled controller should be able to make the necessary corrections and pass the vector to his fighter airplane in less than that time.

While still out of visual range of the enemy, the fighter is vectored by the controller well ahead of its target and about three miles to either side of the anticipated path of the enemy.

The fighter climbs to an altitude slightly below that of the bomber, except in the case of a solid overcast when its position would be slightly above. When the desired position is reached and reported to the ground, the controller gives the fighter a course reciprocal and parallel to that of the enemy. Then, at short intervals, the controller informs the interceptor of the proximity of the target until visual contact is made.

The fighter is fully aware of the enemy's position and, therefore, by anticipating the appearance of the object, he actually extends his unaided visual range. Radar aid in similar situations during the last war proved this to be true, and many fighter pilots spotted the approaching bombers before the bombers were able to locate the fighters. While it is true that most modern bombers carry their own radar, this equipment is flea-powered compared to the powerful ground installations. And the closing speeds as well as the general tempo of operation have been stepped up since 1945, so that this element of surprise still exists to a great extent.

Suppose the rate-of-closure of the two airplanes is 1200 mph; a meteoric speed at first glance, but quite workable when it is divided in two. Let us further suppose that the enemy, in a hurry, retains a speed of 600 mph. The time is getting short, so the fighter pilot throttles back to an arbitrary speed of 400 mph. This reduces the closing speed to 1,000 mph or 1405 feet per second.

At high altitude and with a clean, un scratched windshield, a fighter pilot should be able to spot the enemy at about 10 miles.

NAVY XF4D is new tailless jet fighter designed to be catapulted from carrier decks and climb rapidly to upper atmosphere. It was designed, built by Douglas

Deducting the time consumed in discerning the tiny speck, making accurate recognition, reaction time, etc., all of these reduce the time-figure which means that the fighter has the bomber lined up for battle at a range of 5.5 miles or about 35,000 feet.

The total time for closing with the enemy is 25 seconds. Sounds short? The next time you are flying or even driving a car, time yourself and see how many things you can accomplish in 25 seconds. All the pilot has to do within those 25 seconds is to put the pip of the self-computing gunsight on the enemy and hold it there. Traveling along a curve of interception, he will be at opening range—1,000 yards or 3,000 feet—in 21 seconds. Holding the pip on the bomber's nose, the fighter pilot squeezes the trigger and has time to fire even a second burst. If the fighter is equipped with air-to-air rockets, he has time to send at least four aerial torpedoes into the target.

The opening angle off is about 60°, relative to the target airplane's nose, then to 90° and through 60° astern at closing. Having been subject to only 2 g's, the fighter pilot's muscular reactions are good, and he can avoid collision in the two seconds that are left after he lets go of the trigger. This may sound like a tight squeeze to men who have been under high g loads when they were flying tight pursuit curves in the conventional shots abeam of the bomber. However, to a pilot with only slightly more load on his body than normal, this is ample time to avoid collision.

The real thing might sound something like this. The radar controller sends the initial message:

Control: "Enemy bomber at 30,000 feet, distance 50 miles.

Pilot: "Roger."

Control: "Vector 360. Call when at 30,000 feet. Visual contact in three minutes."

Pilot: "Roger."

Control: "Vector 358."

Pilot: "Roger. Now at 30,000."

Control: "Vector 360. Altitude OK. Contact is 60 seconds at 60 per cent of power."

Control: "Contact in 30 seconds, 15° left."

Pilot: "Roger. . . . Made contact!"

The chances of hitting the target are surprisingly good. If the fighter carries the old 50-cal armament, the extreme opening range disadvantage is cut down considerably by the close grouping of the armament in the nose of the jet fighter. This is reminiscent of the "buzz saw" action of the fire-power unit of the old P-38 fighter of World War II. Viewed from a 60° angle, the target may, in the case of a medium bomber, offer around 200 square feet of target area, not counting the vertical stabilizer.

If the pilot had only four guns, and if the rate-of-fire were only 900 rounds per gun, the pilot would get off about 100 slugs in a two-second burst. Using modern explosive ammunition, this kind of shooting, with only 10 per cent accuracy, would bring down anything but the B-36 class aircraft. Of course, something could always go wrong, and the fighter could rack up a total miss, but there are always methods for multiplying fire power. There is the wingman and the remainder of the squadron.

Battle formations suggested for this type of attack would be somewhat unusual. The squadron would probably operate in elements of two, wingmen trailing at a good thousand yards or more behind. The elements would operate independently, each under separate control from the ground.

British Canberra

The English Electric *Canberra,* twin-jet bomber, may soon be a part of the USAF. According to reports, negotiations are being made for the USAF to get *Canberras* in exchange for F-86's for the Royal Air Force

Since we are on the subject of fire power and the methods for getting it, there are two theories for its accomplishment, and both have their ardent advocates. One was the World War II system where the wingman flew close formation with the lead pilot throughout the pass, and opened fire without sighting on verbal command from the element leader. This idea differs from the defensive wingman who flies behind, slipping, skidding or flying wing down, whose bullets would be thrown widely into space. It differs also from the system where both element leader and wingman aim at the target at the same time, for that would require a small degree of convergence which would cause collision between the two ships. The lead pilot aims—the wingman flies behind but dead parallel. This system had certain drawbacks in World War II, where the fighter's guns were bore-sighted to converge at a fixed point ahead of the aircraft. In the modern jet fighter, they are bore-sighted dead ahead, which means that the wingman's fire would be in direct parallel, resulting in a wider area of destruction but still tight enough to have telling results.

The second approach is the modern one—heavier fire power—guns in the 20-mm, 23, 32 and 37 class which pack enough fire power in a single slug to cripple a bomber with a few rounds. The latest idea, of course, is along the lines of high-velocity spin-stabilized rockets with proximity fusing. These missiles have enough fire power to make even the giant B-36 a very sick airplane.

Getting back to the loose-element idea: in case of a mass raid, formation firing can be done in elements of four until the enemy formation is broken up. Then, a reserve squadron can proceed to mop up the remainder of the bombers.

The position of a supersonic interceptor is even more encouraging. True, the sonic barrier is uncomfortable to cross, although modern airplane design has reduced this discomfort to a remarkable degree, and once the fighter is on the other side, it has the advantage in chasing the bomber. Furthermore, the precision head-on pass won't be necessary, since the interceptor will be able to close from astern within a reasonably short range, and fire a good long burst; all of this while flying at Mach 1.5 or 2.0. After all, bullets have no aversion to crossing the so-called sonic barrier.

Strangely enough, supersonic fighters revive the old and well-tried low-deflection shooting. If the bomber clocks along at Mach .75 and the fighter meteors at Mach 1.5, the rate of closure is about 500 mph. A fighter can open up at 30,000 feet, fire a two-second burst, or let go a couple of proximity-fused rockets. After that, all the fighter pilot would have to do is change his angle of dive slightly to avoid hitting the flying debris—a *slight* change at this speed to avoid high g and quick blackout.

There are certain basic principles in warfare that have changed only in locale and equipment from time immemorial. One of these is the fact that the measure of a fighting man is his willingness to "close with the enemy." Manfred, Baron von Richthoffen, the Ace of Aces of World War I, translated this idea into aviation's needs in his classic description of bomber-handling technique. In 1916 he said, "I close from the stern until I see the rear gunner's face. I kill the gunner, then finish the machine at my leisure."

Let us remember one fact—the possible conflict is *now.* We will have to fight with the weapons that are currently in stock. The rocket-space ships are strictly in the comics, and push-button warfare has shown us only the buttons and very little push. There are supposed to be guided missiles, but there are also countermeasures. This still leaves the decision up to individual men in single-place airplanes who are willing and able to bring the guns to the critical distance and start shooting.

Theoretically, certain advantages can be shown for the bomber's defensive position. However, history has shown that equipment is only a part of the problem. The man who is willing and able to close with the enemy will make the decision stick. That brings us back to the just what makes a fighting man—on land, on water or in the air. To date, there is no formula for determining that fact in advance. You never know until the time comes for a man to get in close and start firing.

Broadside from the Sky

(*Continued from page 15*)

bridges must be destroyed to retard the flow of materials and men from the Manchurian area. At the same time, strict orders prevented the dropping of bombs on Manchurian territory.

This made high-altitude pattern bombing of the bridges difficult. Under the best of conditions some of the bombs might strike the Manchurian end of the bridges, or even fall in Manchuria. This could have caused a critical international incident. To minimize this danger, *Skyraiders* were sent in for the job. Selecting specific bridge spans adjacent to the North Korean shore, thus making them North Korean property, the AD pilots laid their 2,000-pound blockbusters just where they wanted them. Net result: the Yalu River bridges ceased to be useful.

Designed for a useful bomb load of 2,000 pounds, the amount of munitions the AD can actually carry into combat is best described by the terse complaints of the Ordnance arming crews. These fellows agree on one point: "The AD's can carry too damn much!" Early in the war, when a flight of AD's came in over an Army ground communications center and reported the loads they were carrying to ground control personnel, the Army boys could not believe their ears. They sent an Army liaison plane aloft to investigate and report back. The liaison pilot soon affirmed what the Navy pilots had reported.

In a few instances, with a prime target as the goal of their mission, AD squadrons have gone aloft with each plane toting three 2,000-pound bombs. On other missions, the AD's may be armed with an aerial torpedo, two 11.75-inch *Tiny Tim* rockets, and twelve 5-inch HVAR rockets. This armament is equal to the punch delivered by a broadside from a light cruiser, and equals the bomb load carried by B-17's in World War II.

In most cases, however, the AD's armament load is selected to fit a specific sortie, with additional armament for ground-support work and strafing after the prime target has been attacked. A 2,000-pound bomb, for instance, will be hung on the center rack and used against an ammunition dump. The rest of the load may be composed of smaller fragmentation bombs, rockets, napalm (tanks filled with jellied gasoline), and ammunition for the plane's in-built guns. After the ammunition-dump strike, the pilot will "go hunting" along the highways, railroads, and over the hills, looking for suitable targets on which to drop the remainder of his load.

These "hunting" expeditions, conducted between or after specified strikes and often without ground-communication control, have produced some striking results, mainly because of the low altitude at which the *Skyraiders* cruise, thus making it possible for the pilot to pick out likely looking targets. During one such sortie, an AD pilot spotted a strange-looking haystack, went down and plastered it with a rocket. The haystack erupted in a spumy explosion of powder smoke. In another case a "hunting" AD pilot came upon a group of the enemy in a 1,000-foot slit trench on a slope. They were effectively holding up a ground troop advance. He went down and filled the trench with napalm, cremating an untold number of enemy Reds. His reward was the enthusiastic voice of a ground control man in his ears . . . "Boy, you got a batch of them that time!"

The Navy is not the only organization to sing the praises of its Sunday-punching attack bomber. Newsmen and visiting dignitaries are quick to note its efficiency as a low-level fighting machine. Commentator Bill Costello announced on August 23 over the CBS network from Tokyo: "The Navy does have the right plane for the job of front-line strafing and bombing, the Douglas *Skyraider* . . . It carries three tons of bombs, rockets and small cannon shells; has the punch of a destroyer salvo . . . everyone in Korea today who has seen them in action is singing their praises."

In an interview after completing a tour of the front as a Naval Reserve Officer, Representative Hugh D. Scott from the 6th District, Pennsylvania, had this to say: "Well, on carriers the most effective plane is what they call an AD *Skyraider*. It's a dive bomber. It's a tremendously effective plane.

"This particular plane does accurate pinpoint bombing of specific military targets. In addition to bombs, it carries rockets and, of course, 20-mm. cannon. After it delivers its bombs on the target, then it is a wonderful fighter and is used for strafing troops and going down close and supporting troops on the line and picking out camouflaged targets.

"It is a very effective plane. I think it is the most effective plane that is being used in the Korean area."

Coupled with the *Skyraider's* rugged fighting qualities, is the little attack bomber's ability to "take it and come back for more." Out of each 100 AD's in combat duty, between 85 and 90 are ready for flight duty at all times. This availability figure is outstanding when compared with availability figures during World War II.

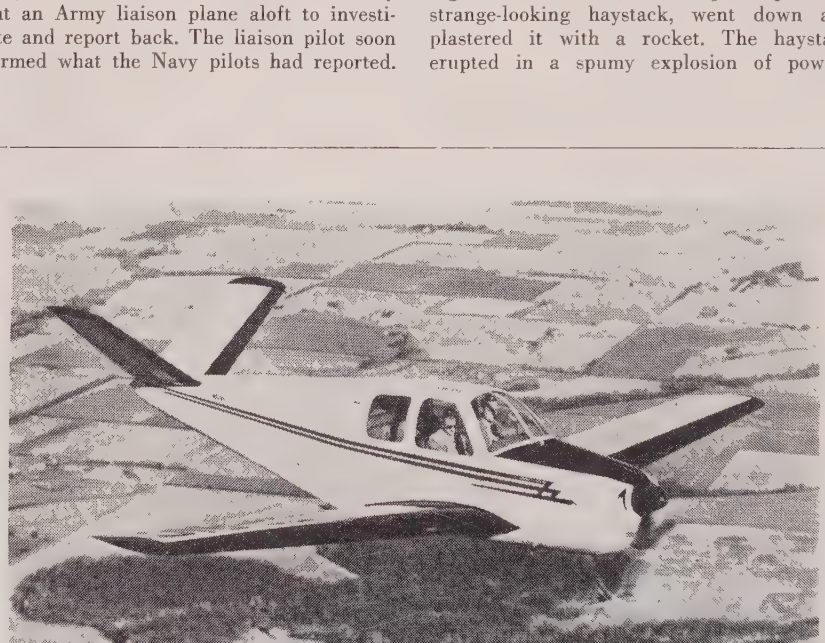
Reports drifting back from the Korean area make special mention of this ruggedness. In one such report from Commanding Officer Richard W. Phillips of Attack Squadron 65, the following remarks and description of an accident were made public.

"The Able Dog (AD *Skyraider*), already proven in peace and war, has shown itself to possess another quality of infinite value . . . it has proved itself able to withstand severe punishment in a forced landing, thus protecting the pilot from injury.

"On 17 September 1950, while on a mission over Korea, the AD-4 piloted by Ensign R. R. Sanders received a small arms shell in the oil system and lost all oil pressure. Having suffered the damage to his plane at low altitude. Ens. Sanders immediately commenced climbing for altitude. The engine failed at approximately 3,000 feet some five miles southeast of Seoul, Korea.

"The terrain at the point of engine failure was quite rugged, the only flat landing being rice paddies—definitely taboo for forced landings. The pilot elected to land on a dirt road, the only straight stretch of which was about 45° down from him.

"Sanders immediately dropped the nose, opened the dive brakes, and aimed for a point short of his desired landing spot. When it was evident that he could make the desired



Bonanza for 1951

The new Beech *Bonanza* is a step-forward in personal aircraft. Basically the same as the 1950 *Bonanza,* the '51 model incorporates several improvements to make it even better than earlier models. Feature is the new hi-strength safety harness (seat belt and shoulder harness). Stall characteristics have been improved through new wing-root fillet; take-off horsepower rating has been increased from 196 hp at 2450 rpm to 205 hp at 2600 rpm; cruising speed also has been upped to 175 mph.

point of landing, he closed his brakes . . . banked his plane and lined up with the road.

"Suddenly, a tree loomed up ahead. With plenty of airspeed, Sanders could have pulled up over it but felt by doing so would jeopardize his chances of stopping the plane in the road before it plunged over the bank ahead. He, therefore, decided to go through the tree at a point which appeared to be about one foot in diameter. The plane struck the tree at the wing root and went right on through.

"The airplane touched the ground at a speed of about 135 knots. The lower dive brake hit first, forcing the nose down onto the ground before shearing off. The plane skidded for 100 feet, nosed up to about 45°, then dropped back down.

"The pilot received no injuries in the accident, the plane did not burn, and it appeared to be damaged no more than would be expected from a normal forced landing. The radio still was receiving transmissions as the pilot left the cockpit."

The survival of the AD-4 while cutting through a tree trunk one foot in diameter is not unusual in the light of other damage reports. Another AD-4 received a 40-mm. shell through the bottom of the fuselage, the shell exploding about eight feet behind the pilot. Another received an A/A hit in the starboard stub wing which exploded the ammunition boxes and tore holes in the upper and lower wing surfaces. An AD-4Q was struck by a 40-mm. shell just aft of the bottom dive brake, and again the shell exploded inside the fuselage. After these direct hits, all three planes remained airworthy and were able to return to the carrier. The only injury was a slight cut on the AD-4Q's pilot's face.

Excerpts from a single naval news release describing activity of the AD *Skyraiders* for a single day, 16 November 1950, from aboard the *USS Valley Forge* attached to Task Force 77, are relevant of the intense use of the little attack bomber. The release begins with these words: "Pilots dressed in their electrically heated flying suits roared off the windswept flight deck of the *USS Valley Forge* in sub-zero temperature today to lend close air support to United Nations ground forces north of Pungsan.

"Enemy troops had firmly entrenched themselves on a ridge approximately five miles north of Pungsan and had stopped the advance of the United Nations troops. *Skyraider* pilots . . . brought in their aerial artillery to clear the obstruction. Although they were constantly under fire from ground gun positions, the pilots continued their runs until they had deposited their three tons of anti-personnel bombs on the enemy.

". . . Reports from the ground controller said, 'The attack was near perfect. Well done.'

"Taking off shortly before noon, LCdr. Norman D. Hodson . . . led a dive-bombing attack on the railroad bridge at Kaegogae-Dong which crosses a tributary of the Yalu River. Hodson reported that the rails, roadbed, and the approach to the northside . . . were destroyed. Flying low over the countryside on the return trip, Hodson spotted some haystacks.' A few rounds of 20-mm. were put into one stack and it exploded as the supply truck beneath the straw caught fire. The squadron then destroyed the other three camouflaged trucks.

"Lt. Marion 'Bud' Gallagher and Ens. James Pavelle conclude the daylight operations by destroying the military warehouses of Samperi by dive-bombing attacks. All planes returned safely to the carrier. Fifteen tons of bombs were dropped on the enemy."

During the Korean conflict, the carrier-based *Skyraiders* have been attacking without fighter-plane cover. This was for several reasons. First, the range of the AD, permitting it to stay over the target area for from two to three hours, or to seek auxiliary targets after attacking the prime objective, exceeds the range of any available jet fighter airplanes. Secondly, the low altitude at which the *Skyraiders* deliver their most telling blows is in itself effective protection from enemy jets which operate most efficiently near stratospheric levels. And third, once its bomb load has been dropped, the *Skyraider* is sufficiently speedy and versatile to fight its way back to the carrier without cover airplane help. On the few occasions when cover protection was deemed necessary, the *Skyraider* squadrons were split up, some serving as cover airplanes while the remainder went in for the job at hand.

As always happens in armed conflict versus peacetime planning for armed conflict, the Korean War has showed some serious flaws in air-strategy plans developed following World War II. Domination of the Air Force by the big-bomber intercontinental warfare school is definitely past. Those who placed a dead hand on the development of close ground-support airplanes must now admit that they were wrong. Without *Skyraider* ground support in Korea, there is some doubt that the United Nations troops would ever have broken from the early encirclement in the Pusan area. The ability of ground-support aircraft to move quickly from one emergency to the next, delivering telling blows when and where they are most needed, and to seek out and destroy enemy concentrations, materials, and supplies close behind the line of conflict, has proved to be one of the most valuable tactical operations available.

Multiple versions of the Douglas AD *Skyraider* are in use in Korea. These vary from the straight attack and dive-bomber types, through night, search, early warning, etc., types. The El Segundo Plant of Douglas Aircraft Company is turning out new and replacement AD's in ever increasing numbers. The Navy has vouched for the *Skyraider* by awarding contracts for many more.

The Navy can be proud of its part in the Korean War. No one will deny that seapower and carrier-based airpower played important roles in every success of the campaign. Nor were they lacking when disaster threatened. The low-flying *Skyraider* attack bombers delivering "broadsides" far beyond the reach of naval guns gave the Navy an inland punch it has never before enjoyed.

As Admiral John W. Hoskins puts it: "So long as three-fourths of the earth is covered with salt water, it will be a highway for aircraft carriers. So long as we have high-speed carriers and planes of present quality, there is no military target out of our range."

This is not an empty boast, for off the mud flats and rock-bound coasts of Korea, the test of battle has supported the Navy's long-held concepts of war.

USAF Beavers

The Air Force recently received the first six *Beaver* C-127's, designed and built by De Havilland Aircraft of Canada, Ltd. *Beaver* pictured here wears Alaskan markings: red tail and wing tips. Also note winter cowling. The *Beaver* is powered by 450-hp *Wasp Jr.*, has top speed of 179 mph at 5,000 feet, cruises at 137 mph. Belly tank gives the *Beaver* a range of 910 miles.

Zero Zero Talk-Down

(*Continued from page 17*)

he was over the Santa Monica Airport, but wasn't sure. The surveillance radar crew was able to identify his plane after he made a few identifying turns, and directed him in over the Los Angeles terminal. The tower report mentioned that "although the pilot had a great deal of trouble turning to and holding compass headings," the aircraft landed safely. Again the ceiling was 800 feet and the visibility seven miles.

Not all the Los Angeles "saves" have been at night. A pilot called Los Angeles Approach Control, lost and on actual instruments. He had taken off from the small El Monte Airport across the sprawling town of Los Angeles and had tried to get into Santa Monica by picking his way around the fringes of the clouds. Once he plowed into a cloud and made a fast 180° turn back into the clear. Then he tried it again and couldn't find his way back out of the soup. He climbed to 4300 feet on instruments and called for help. The controller in the tower had him check the signal he received from the Los Angeles LF range. The pilot reported a strong "N" signal and the controller identified his ship on the radar scope after he made a single turn. About this time the plane's spinner split and blew off, but the pilot remained reasonably calm and the GCA operator talked him into the International Airport for a routine landing even though the ceiling was down to 500 feet with visibility restricted to a mile and a quarter by light rain and fog.

This Los Angeles GCA installation is the first in the country to be designed and built as a permanent unit for a civilian airport. Three GCA units in operation at Chicago, Washington and LaGuardia are semi-portable trailer units converted from surplus Air Force equipment. Partial reason for installing the first unit in Los Angeles was that Gilfillan, the manufacturer, is located here. Cost of this original installation was roughly $200,000.

The Los Angeles installation is divided into two separate units. Airport Surveillance Radar (ASR), a traffic-controlled instrument, gives an accurate picture of all aircraft within a radius of 30 to 60 miles. A map is made on the face of the scope and aircraft show up as "pips" of light. The screen is coated with a phosphorescent material that continues to glow for some time after being activated. Since the ASR antenna is continually rotating through 360°, the controller has a continuous picture of all traffic in an area of 2800 square miles around the airport, revised every two seconds as the antenna revolves.

The other half of this radar team is the Precision Approach Control (PAR) unit. The electronic principle is the same, but PAR monitors only the progress of an airplane on an approach to an instrument landing PAR shows all three dimensions: range, azimuth and elevation on a single scope and is interested in nothing beyond the final approach path. The PAR antennas scan only an azimuth of 20° in an arc at the end of the main instrument runway and 6° in a vertical arc to give altitude information. There are two PAR scopes, one covering 10 miles distance from the field on the final approach, and the actual touch-down scope covering only the last three miles into the runway. Controllers can determine the position of an aircraft within 10 feet in elevation, 20 feet in azimuth and 300 feet in distance at a range of one mile from the end of the runway. The accuracy of these readings increases as the aircraft approaches the end of the runway.

Together, ASR and PAR form the complete GCA system.

It takes from six weeks to three months to make a good GCA operator of a regular tower controller. When the Los Angeles installation was under construction, seven of the local tower operators went to Chicago to train on the portable equipment there. They then returned to Los Angeles and checked-out the remaining 11 operators. All but three of the Los Angeles tower operators are also licensed pilots so they know just what's happening in the cockpit.

Some pilots of the domestic airlines have been quite suspicious of the benefits of GCA. Apparently they don't want any control of the airplane outside of the cockpit. Most military pilots and airline captains who have had extensive experience overseas appear to have complete faith in this talk-down approach method since they have made frequent let-downs with GCA outside the United States where no other radio aids were available.

In an effort to acquaint more pilots with the use of GCA, the Los Angeles office of the CAA has prepared a pilot information letter that explains this rather touchy subject in the following manner: *"The procedure to utilize this picture information (on the GCA scopes) can be summarized as 'Operation Teamwork.' Captain of the team is the pilot, who is at liberty to accept or ignore any information or advice given him. By means of ordinary radio-telephone equipment, the airport traffic controller steps aboard the plane to act as temporary navigator. He can tell the pilot exactly where he is. He can tell him exactly what course to fly to get where he wants to go. When the pilot is on the approach, he gives him the information needed to maintain the ideal approach and glide path until he touches down. He also advises the pilot of the position and courses of other traffic in the vicinity. All this can be done with no additional equipment in the airplane (other than radio-telephone and basic flying instruments.)"*

In this job of selling radar to skeptical pilots, the CAA letter further suggests that *"the pilot may acquire confidence during practice approaches, he should be hooded and carry a safety pilot. . . . A pilot making a practice GCA should never make visual reference to the runway while on final. That he is doing so is usually obvious to the controller. . . . If a pilot wishes to test the efficiency of radar operation, he may do so in several ways. He may correct poorly or not at all. He may simulate transmitter failure, or he may pretend to be lost. In any event, the controller's subsequent course of action is bound to increase the pilot's confidence in him. However, do not simulate receiver failure."*

The pilot is protected against radio receiver failure by the standard PAR technique. Once on final approach, the pilot is advised for example: "You are now on final approach to runway 25L, six miles from touchdown; do not answer further transmissions; if no transmissions are received for a period of five seconds on final, use missed-approach procedure." In other words when you don't hear that man who is talking you down for five seconds, pull up and go around.

The helping hand of this GCA unit is not restricted to the Los Angeles International

rport alone. With the large 30-mile sur-llance scope at Los Angeles, lost aircraft y be directed into the traffic pattern of y nearby airport. Planes have been epherded into Santa Monica, Hawthorne d many of the smaller airports in the inity. Frequently visiting aircraft enter e Los Angeles area at night or under re-cted visibility due to smog, and the ASR it guides them to their destination. Many ots become confused at night from the ze of lights in Southern California that ke airport markers next-to-impossible to ntify unless the pilot knows their approxi-te position. ASR guides them home.

Recently an Air Force reserve pilot in a 26 made three passes into the Long Beach rport and missed the low cone of the radio nge each time. His ceiling was only 400 600 feet. After his third pass, the pilot came flustered and absolutely lost. Long ach advised him to contact the Los Angeles wer and the GCA crew identified his plane ter a series of turns as being 20 miles off ore, flying parallel to the coastline. Rather an return to Long Beach, the pilot re-ested a GCA let-down into Los Angeles, d he landed with less than 30 minutes el aboard.

In a somewhat similar episode, a Marine vin-Beech became lost over Long Beach ile attempting an instrument let-down. e Los Angeles tower tracked him down rough a 2,000-foot overcast and then gave m the correct compass heading back to ng Beach.

Even experimental jet aircraft have been aved." A brand new Douglas experimental hter-bomber called in for an emergency nding after an engine failure over Long ach at 6,000 feet. A layer of broken stratus uds at 900 feet was blocking part of the proach pattern into Los Angeles, but the t pilot was given the correct heading to ss the clouds and land straight-in.

Jets make the poorest "pip" on the radar reen, transports make an excellent radar rget, but the air mail helicopters make best showing on the scope. Several prac-e radar approaches have been made by helicopter pilots of Los Angeles Airways.

"How can you tell which plane is which?" most tower visitors, this is the first estion asked. Normally, there will be a ndred airplanes over the Los Angeles ea on a clear weekend, but when the ather socks-in and GCA is really needed, re aren't many planes in the air. Aircraft ntification is speeded up by having the ot tune to the LF range and tell what nal he is receiving. Then he can tune the nearby Long Beach or Burbank ranges an additional check which cuts down area in which he can be flying. Then tower operator will request the pilot pick up a certain heading and make a turn. By watching his scope, the operator usually identify the plane at once. Then gives the pilot a heading to the airport follows the "pip" on the radar screen m there.

During daylight hours, the radar operator zipped-in a large air-conditioned canvas closure so that there is no outside light nterfere with his vision on the fluorescent pe. At night, this "tent" is pulled up of the way.

GCA radio transmission is normally chan-ed through one of a dozen VHF frequen-s. However, instructions may be given over the regular 278 kc LF control tower on the 332 kc LF radio range station.

Not all of the "saves" made by GCA are caused by a pilot flying himself into weather conditions that he cannot handle. Recently the pilot of a chartered Beech *Bonanza* called in by telephone from San Bernardino, 60 miles away, that she had two nurses as charter passengers who had to make a United Airlines DC-6 flight to Chicago to assist a special patient. The weather was down to 400 feet (Instrument minimums at Los Angeles are 300 feet and one mile) but United advised that they would hold their departure for an additional five minutes if the pilot was able to get into the field. Over the Los Angeles city hall, 12 miles from the airport, the *Bonanza* pilot was unable to stay under the weather and pulled up into the overcast. The pilot immediately called the tower with a quick position report and the GCA crew took over. The *Bonanza* was talked into the field and the passengers made their flight on time.

"All pilots should remember that it is illegal to fly on instruments without an instrument rating," reminds CAA Chief Airport Traffic Controller Lemmer. "It is also illegal to fly on instruments within an airport control zone (Normally 5-mile radius of the airport) without a flight plan. Whenever it is obvious that there has been an irregularity, we file a report with the Air Safety representative in the local CAA office. He, in turn, checks on the pilot's qualifications and issues a violation if the pilot does not have a 'gage' rating on his license. However, we would much prefer to write that violation than read a newspaper headline the next morning.

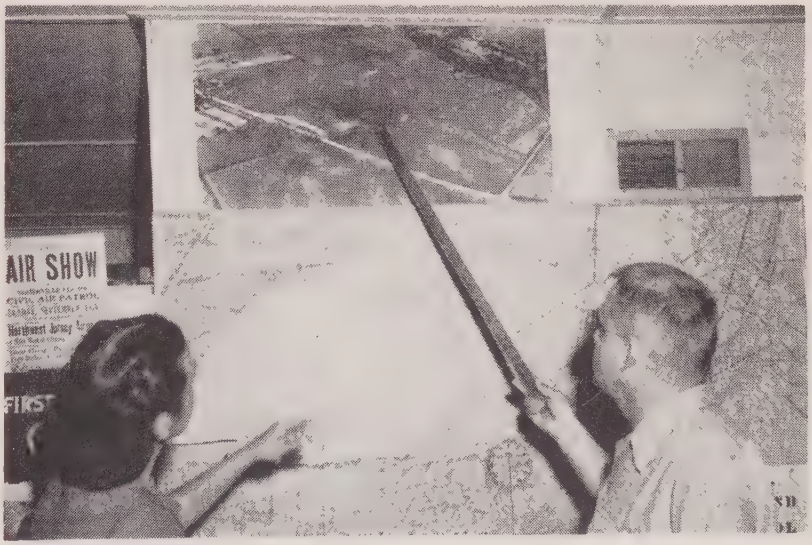
"The controller in the tower never refuses an instrument clearance except for reasons of conflicting traffic. A pilot can land in zero-zero weather if he wishes, but the weather must be at least 200 feet and half a mile (higher for non-airline equipment) for a legal instrument approach. We talked-in an Air Force pilot in a B-25 recently when the ceiling was only 100 feet and the visibility 1/16th of a mile. It was so soupy that he couldn't even see to taxi off the runway."

When a pilot asks for a GCA let-down, the tower operator assumes that he is a rated instrument pilot. If his let-down is routine, no further investigation is made, but if the pilot's actions show that he obviously has had no training in instrument flying, a report is turned in to the flying safety section.

A Stinson pilot en route to Los Angeles from Las Vegas, Nevada, called in on-top and lost with less than 30 minutes of fuel. He was very erratic during his talked-down GCA approach and actually went into a spin or a very tight spiral while on instruments. Fortunately, the ceiling was 800 feet and the pilot was able to recover after he broke out of the bottom of the clouds. The pilot received a violation—but not a broken neck.

As more days of experience go into the logs of this first permanent airport GCA unit, the record of "saves" piles up. As this fame grows, the number of pilots who ask "Do you mean that you can talk me down?" will soon vanish, and lots of lives will be saved.

WING TIPS . . .



This airport operator found that a large blow-up of an air-view of his field comes in handy in explaining traffic procedures to student pilots and visiting airmen. Posted on the bulletin board in the operations office, the enlarged air-view proved infinitely more helpful than the conventional drawing that shows the landing strips and field layout. Familiar objects around the field boundaries are easily and quickly recognized at a glance, and this "understanding" of the field layout enables a pilot to do a more intelligent job of flying traffic and taxiing properly. This air view is 18 by 36 inches in size. *Bob Blatt*

Black Cats

(*Continued from page 23*)

the sleek, tough sky cruisers with instrument panels designed to do everything but kiss the girl friend, I get a funny feeling in the knees thinking about those wood-and-wire crates we flew back in the '20's. And some of us lived to tell about it in spite of the fact that we defied every superstition we could find—a fitting profession for 13 black-sweatered flyers displaying the number 13 and slinky black cats on their chests. Names were juggled to hold 13 letters, and every Friday the 13th we strained every one of our cat's proverbial nine lives, and performed our latest gags for the newsreel cameramen.

It began as any business venture in 1924, when "Spider" Matlock, "Bon" MacDougall and I purchased three over-used ex-Army *Jennys* and set out to get the public air-minded with thrill rides at five, 10 and 25 bucks a take-off from Burdette airport, outside Los Angeles.

We managed to find and hire two "daredevil" stunt men, rare specimens in those days, to publicize our flights. Our last nickels went into a splurge of advertising, but it brought out an excited Sunday crowd and that's what we wanted. We got excited, too, watching the potential business, but that soon turned to the shakes—the "death-defying daredevils of the clouds" that we'd hired didn't show up.

Spider and I got the idea at the same time.

"I will if you will," he said.

I swallowed. "It's a deal, chum."

We took off with Bon at the controls and scared ourselves with some plain and fancy wing walking. The crowd loved it.

When the first shock was over, so did we!

We decided the stunting racket was a cinch and formed a gang of our own, figuring we might as well save the money we'd have to spend for "professionals." Our roster included Art Goebel, who later won the Dole United States-to-Honolulu race, Paul Richter Jr., Ivan "Bugs" Unger, Frank Lockhart, Albert Johnson, Herd McClellan, Billy Lind, Sam Greenwall, International Newsreel cameraman Morrison Stapp, and actor Reginald Denny. Denny was a top pilot in World War I but was obliged to become an honorary member of "the Cats" because the studio didn't want to lose their investment. Unger's introduction to the game was by free-balloon parachute jumping with his uncle Ed, the granddaddy of all balloon jumpers. McClellan was an old-time circus stunt man and parachute jumper. Lockhart was a racing driver.

We were a fast-moving bunch but we were as business-like about our job as if we were running a hot dog stand or a ladies ready-to-wear shop. Fortunately, flying in those days never became as monotonous as selling hot dogs and the hurdles were more unpredictable than girdles.

The routine flights to the scenes of some of our stunt work should have turned us to easier ways of making a living. Spider, Bon and I took off to do an exhibition over a Bakersfield race track some hundred miles from Los Angeles. The lack of a compass was no problem because we knew the general direction of Bakersfield and could follow the automobile road. A string thumbtacked to the dash board would tell us when we were wrong side up in the clouds. En route, a hole burned through our exhaust stack. Before we could decide that there was nothing we could do about it anyway, the plane reached its ceiling while we were still climbing to get over the mountains. We threw out the thermos bottle, fire extinguisher, tools and, finally, frantically heaved out our shoes.

We made it by the shoes!

The fire-spurting exhaust became only an annoyance after that and we reached our destination to see the remains of another stunt plane alongside the race track. Dropping down to 50 feet we did our wing walking and landed on the straightaway. Without brakes, the plane bounced dangerously into the banked turn. Spider and I jumped down and clung to the wing tips, digging our feet into the turf until the plane stopped. We knew she'd never take off from that short run with the three of us and we ignored our fears that she might not get off at all. Fifteen men held the wings while Bon revved up the engine. When Bon signaled, the men let go and the plane roared down the track to clear the fence and trees by inches. He landed in a nearby field and we joined him there to take off for Los Angeles. Flying in fog, we came down to get our bearings and found the Pacific Ocean. We headed toward land and came down in a beet field when our gas ran out. A farmer helped us locate gasoline, but without a funnel to get into the fill-pipe under the wing, we spent the afternoon filling the tank via a whiskey bottle. We got off the beet field and arrived over our home airport at night without landing lights. Bon judged the field level by the night light in the office window. We found the ground, but ended up in a ditch at the end of the field, and the plane lost its landing gear.

After this, MacDougall kept a sponge on a string in the field office—"to sop us up with," he always said!

When Al Johnson, Spider Matlock and I went up to make the first multiple parachute jump in history, the load was almost too much for the plane. It finally gained enough altitude but Spider got over anxious and fell off. He jerked at his rip cord. Nothing happened. Wildly he yanked as he plummeted toward the ground. In desperation, he tore the rip cord assembly right out of the bag. The chute opened at 200 feet. Spider glimpsed tomatoes close enough to count, and landed—intact and completely unhurt.

Al and I stayed with the plane and came down to find that a makeshift elastic band Al had used to keep the ring in the harness didn't have enough stretch to permit the cord to release the chute. We helped him repack it, changed the band and went back up to make our mass parachute leap before the cameras of Pathe and International Newsreel.

Our worst parachute accident was caused by a chute which opened beautifully at the wrong time. During a spot landing contest, Al Johnson crawled out on the leading edge of the wing to get ready for his jump. As he passed the stagger wires, his rip cord fouled on a wire. When Al turned to see what was holding him, the chute snapped open and shot back through the upper V's of the wires. It dragged Al with it, tearing off patches of skin and bouncing him off the tail of the ship. He fell into the air, half conscious, under a badly torn parachute which dumped him over the side of a hangar and banged his head on the building.

To us Black Cats, parachute jumps were only another way of getting out of a ship. Ordinary jumps didn't supply enough thrills for the Newsreel boys so they took us up on our motto. They had me sit on the upper wing while a pilot looped the Colorado Street bridge right after someone committed suicide by jumping off the span.

The newspaper boys played us up as "nerveless," "the intrepid daredevils of the air," etc., but there were times when we were just plain scared. Al Johnson and I were scheduled to do a double rope-ladder stunt but couldn't find two ladders the same length. We spliced extra steps on the ladder I was to use. While we hung on our 80-mph flying trapeze, I happened to look up and saw a splice about to break. I hauled myself to a higher step as the rope parted. When we landed, we discovered that one of the spliced lengths of rope was rotten!

And there was the time Art Goebels and I were sent to Dry Lake to make a movie scene of two men fighting with each other as they descended, both hanging from one chute. At the high altitude of the lake bed 5500 feet, our *Jenny*, which at best had a ceiling of about 7,000 feet, could only reach 1500. Art crammed the plane to its limit and gave me the signal to go out on the wing and strap "Max" the dummy, to my

MAIDEN FLIGHT—First of 14 *Comets* ordered by BOAC takes off on maiden voyage. *Comet* is pure jet airliner expected to go into operation late this year

belt. I had a desperate struggle with Max in that wind. I got him fastened and climbed back to the trailing edge of the wing. He dangled between my legs, a bad position for the jump. I tugged at him, trying to pull him back on the wing and suddenly noticed the pilot's face go dead white. He waved frantically and I jumped. In the few seconds it took me to hit the ground my chute didn't open fully. I landed hard in a patch of cactus, on top of Max!

Max and me being on the wing had caused Art to lose altitude so fast that he was about to crash when I saw his signal to jump. We made the shot someplace else.

Another of our escapades created this headline: "*Three Young Idiots Endanger Lives of Thousands.*" The "Young Idiots" idea didn't bother us as much as the fact that we had endangered people's lives. We had made elaborate preparations for a demonstration between the halves of a USC-Stanford football game. My wife had painted footballs in the school colors and made parachutes to match. As Spider, Bon and I flew toward the Coliseum, we stuffed the footballs in our sweaters and Spider and I climbed out on the upper wing. Bon flew right down over the heads of the excited crowd. While we were throwing our footballs and waving, the engine sputtered. Bon struggled to keep the plane from crashing into the grandstand. We saw his frantic "come-in" signal and scrambled off the wing into the cockpit. With our weight released from the wing Bon was able to pull the plane up and out of the stadium, missing the top row of seats by inches. We landed in a vacant lot near the Coliseum. A radiator leak had poured water over the spark plugs and caused such a loss of power that Bon hadn't been able to maintain altitude. We parked the ship, got a cab and went back to see the rest of the game.

How we Black Cats lived through these goings on could only be explained by the nine-lives theory. There was the time Paul Richter took a student up to teach him to fly front cockpit in a plane with dual controls. The plane went into a spin from 800 feet and crashed into a truck garden. Notified by telephone, we rushed out with an ambulance to pick up the bodies and found Richter and the student uninjured. Paul thought the student was flying the plane and the student thought Paul had the controls!

We were proud of Richter the day of the dead-stick landing contest when he competed with Swede Olsen. The Swede was the best in the business of dead-stick landing and Paul was determined to beat him to uphold the honor of the Black Cats. Paul went up to 5,000 feet, cut his motor, looped, spun and rolled his ship until he was breath-takingly close to the ground. Side-slipping toward the white chalk line on the field, Paul saw that he was going to overshoot his mark. Heading straight for the crowd, he pulled up into a loop, just missed the grandstand and landed upside down but right on the line. While the awe-struck crowd still gasped, Paul climbed out of his plane and dusted the chalk of the line off his jacket. The Swede could never beat that. But the rules of the contest stated that the plane had to land right-side up!

Girls clamoured to join the Black Cats and a few did work with us in some of our stunts but were never made members. One of the best was Cherie May, a pretty little brunette who added 70 parachute jumps to her credit, did plane changes and usually won the parachute spot-landing contests in competition with the best professional stunt men.

Another of our favorites, Gladys Roy, played a tennis game with Ivan Unger on the top wing of a plane. After risking her life in stunts like this, she was killed on the ground. Getting ready for a take-off and with her back to the plane, she misjudged her distance, turned and walked into the whirling propeller.

The 13 Black Cats had practical jokers, too. The worst of the bunch was Bon MacDougall who would creep up behind you, put an egg on your head and smash it. We cured Bon of this habit by lining his flying helmet with furniture glue. It went on easily but it took him two days to get the thing off and most of his hair came with it.

MacDougall's strange sense of humour flunked a would-be member of "The Cats." Bon took him up and told him to climb down a rope fastened under the plane, and hang there. The boy obliged and MacDougall flew on paying no attention to the aching muscles of the terrified stunter. Finally, Bon soared out over the ocean and the exhausted amateur promptly let go. When MacDougall last saw him, he was swimming toward shore, apparently cured forever of his desire to be a Black Cat.

Al Johnson took the craziest chances because he did things on the spur of the moment. He risked his neck a hundred times in the air doing hair-raising stunts, and then was killed doing a routine take-off on the first day of shooting for the movie "Hell's Angels." His motor conked and he ran into a high tension wire.

One of the most realistic shots in "Hell's Angels" cost the life of another stunt man, Phil Jones. Phil had applied for membership in the Black Cats and was acquiring the necessary experience. The cameraman had waited several days to get the right cloud effect for background against which Al Wilson was to pilot a rebuilt, rickety German *Gotha* bomber and put it into a spin as though it were about to crash. Phil's job was to sit back in the fuselage and release 15-pound sacks of lamp black to give the effect of smoke as the plane spun down. Both boys knew when they went up that the flimsy craft might not come out of the spin. They started down. Al struggled to level out, decided it was hopeless, and jumped. Phil must have been blinded by the soot and didn't see Al bail out for he stayed in right to the ground, still releasing his lamp black. Audiences who were thrilled with that vivid shot of a bomber flaming to the ground, twisting its long trail of smoke across the sky, were unaware that a live stunt man was inside with the imaginary Germans.

FLYING BUSINESSMAN—First to win Ryan award as "Flying Businessman-of-the-month" was George Patterson

My worst case of jitters set in during a stunt for Pathe News. Al Johnson and I went up to play an aerial poker game on the upper wing of Bon's plane. Two chairs and a table were wired to the top center section. To make it more exciting, no chutes were to show. I didn't wear one—why I ever let them talk me into that, I'll never know. Al's parachute was strapped to his back, out of camera range. We were to play for a few minutes, get into an argument to be climaxed by me standing up and shooting Al. He was to fall backwards off the wing, opening his chute after he had dropped out of the picture.

We took off in high spirits. Art Goebel, flying the camera ship, gave the signal to start the card game but suddenly Al slipped from his chair in a dead faint. I jumped forward and grabbed him by the ankle, sliding down on the leading edge of the wing to brace myself. Squeezed against the hot engine, without a chute, I clung to Al's heavy, limp body, and felt myself slipping. Frantic ways of attracting the pilot's attention snatched at my mind until I saw the deck of cards still clutched in my sweating hand and snapped them into the pilot's face. He stood up in the cockpit and grabbed for Al's ripcord. Somehow he reached it and pulled. The chute opened. I released my hold on Al's ankle and the chute dragged him off the wing. Twitching all over, right down to the roots of my hair, I clung to the wing until we landed. We found Al in a field of daisies, still unconscious. He must have used one of those nine lives because he wasn't even scratched. I felt as though I'd used six of mine!

The Black Cats finally broke up when competition pushed the prices too low. Spider Matlock and Frank Lockhart turned to automobile racing which eventually brought death to both of them. Herd McClellan, anxious to make a come-back in stunt work, lost his life for $3.00. Herd was an amateur inventor and his last idea was a bullet-proof vest made of fine steel ribs welded together and overlapped like the feathers on a bird's wing. To get publicity, he agreed to demonstrate his invention for the Newsreel camera for the cost of the ammunition—$3.00. Marion Semellyen, a crack pistol shot, donated her services. The cameras ground while Marion pumped 30 shots into the vest. Herd's invention was a success. For a climax, he decided to add a novel touch. He swung on a rope, a human pendulum while Marion tried to hit him. The 40th bullet penetrated the vest and Herd died a few hours later.

Some of the Black Cats are still very much alive and active in the aviation industry. Life isn't as exciting for us now but our wives are much happier. And, as I said, if there is an after life on another planet and it's equipped with flying saucers, you can bet Spider and our boys are flying them right back into our atmosphere and headlines.

1st Air Force

(*Continued from page 29*)

ing Officer, Floyd Bennett Naval Air Station, Brooklyn, N. Y.

2233rd AFRTC—Colonel Luther B. Matthews, Commanding Officer, Mitchel AFB, New York.

2234th AFRTC—Lt. Colonel Cleon E. Freeman, Commanding Officer, Hanscom Airport, Bedford, Mass.

2236th AFRTC—Lt. Colonel Harrison R. Christy, Commanding Officer, Standiford Field, Louisville, Ky.

2237th AFRTC—Lt. Colonel Frederick C. Roberts, Commanding Officer, Newcastle Municipal Airport Delaware.

The main feature of 1st Air Force reserve training is Troop Carrier aviation, with reservists training in Curtiss C-46's and Douglas C-47's. Each Air Force Reserve Training Center is in charge of an Air Force Reserve Wing. The 2333rd AFRTC directs the activities of the 514th Troop Carrier Wing, commanded by Brig. Gen. Arthur L. McCullough. The 2230th has the 63rd TC Wing, under Colonel Clayton Stiles. The 2234th supervises the 89th TC Wing, Colonel H. C. Stelling, CO. The 2236th has the 436th TC Wing, under Brigadier General Albert M. Woody, and the 2237th AFRTC has the 512th TC Wing, commanded by Brig. General E. H. Molthan.

In addition to the Troop Carrier Wings, the First also supervises training and operation of 37 Volunteer Air Reserve Training Groups in its area. Unlike Air Reservists of the organized units, the VART members do not get paid, but do receive credits towards retirement and promotion.

In order to reach its announced troop strength of 971,000 as soon as possible, the USAF has ordered its 21 organized Air Reserve Wings into active military service. At least 12 more Air National Guard Wings are being mobilized and assigned to the Air Defense Command for protection of the continental United States.

The Troop Carrier Wings of the 1st Air Force already have been ordered into active military service. Personnel of the Wings are undergoing short periods of active duty during February and March for processing, in order to determine their physical qualifications, final skill classifications and their availability status. Individuals successfully passing physical examination and meeting final skill classification for their assignments in the Wing will then be given at least 30 days to adjust their personal affairs prior to reporting for active military service with the Wing. This is more or less the pattern for the entire country.

The Air Force has explained that while all the Air Reserve Wings affected will be ordered into active service as units, they will not in all cases remain as units. After being ordered to duty, 15 of the Reserve Wings will either be broken down to smaller components, such as squadrons, or their members will be reassigned as individuals throughout the USAF. The primary consideration in this move is the effective utilization of trained and skilled personnel.

It was also pointed out that the Reserve Wings scheduled for active military service offered a wealth of trained and skilled manpower. These men could be fitted into the machinery of the present-day Air Power with a minimum loss of time. Their absorption into the regular Air Force will require no great training program. For example, a qualified World War II B-17 pilot who has continued his flying as a Reservist would need only a short time to learn to fly a B-50.

It also was explained that an equally important advantage in dispersing these Air Reservists was the fact that they could raidily be converted into instructors within their fields. With the latest developments and advances at their fingertips, these men could be sent to Air Force bases throughout the country to form a nucleus for an expanded operational program.

One way in which the Reservists have been preparing for this great responsibility is by working very closely with members of the Regular Air Force. In a recent message, Brig. General Emil H. Molthan, a prominent Philadelphia business executive who commands the 512th Troop Carrier Wing at the Newcastle (Del.) AFRTC, said, "The desired objectives of national defense can be obtained most expeditiously when both the Regular and the Reservist constantly maintain the relationship that exists when one friend is helping another friend to do a job which is very important to them both and to their fellow citizens. Regulars and Reserves, Officers and Airmen—all are members of the Air Force Team.

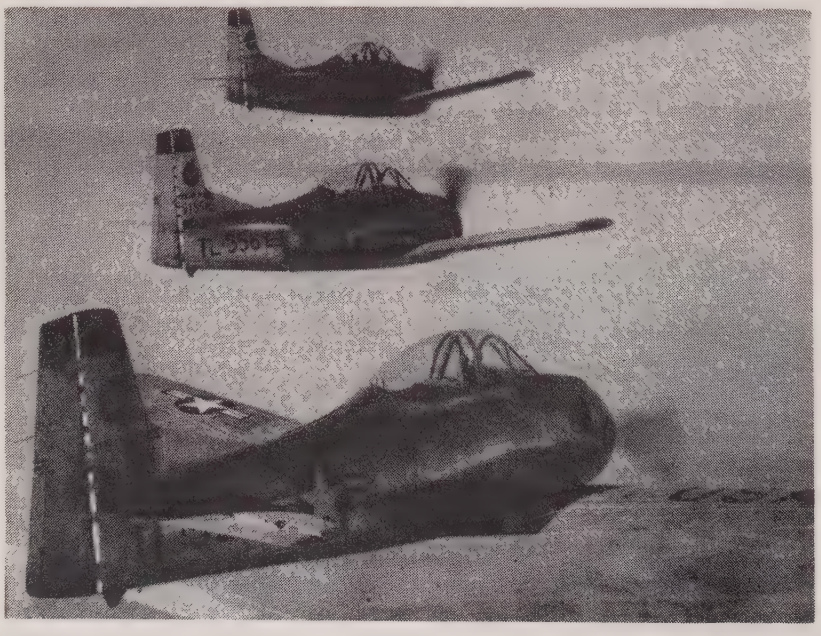
'The word 'team' is used advisedly, because the mission of the Air Force cannot be performed in time of emergency unless everybody on the team knows his position and his job, and does his job well. Every member of the team, Regular and Reservist alike, is expected and must be prepared to do his own job in a way that will provide support and assistance to those who are working or fighting on either side of him, and above and below him. This is the spirit of our new Air Force team."

An excellent example of this is the program carried out last year by the 89th Troop Carrier Wing at Hanscom Airport, Bedford, Mass. Reserve officers and airmen assigned to this Wing have been most enthusiastic in describing their Wing-AFRTC integration plan as the most workable and efficient method of vitalizing the Air Reserve program. Every other week-end and each month, the Reserve units under the Wing reported for training. Each Wing and Group staff officer from the Wing Commander down took his place at his desk in the same office as his AFRTC counterpart. The Troop Carrier Group and squadrons have a separate Quonset hut each for their own orderly room and operations section because of the size of the units. There are several Reserve officers on active duty who hold key positions in both Wing and AFRTC—for example, Major Charles D. Briggs, 89th Troop Carrier Group commander, who is also the 2234th AFRTC Deputy for Operations and Training.

During calendar 1950, 20,280 aircraft hours were chalked up by the 89th TC Wing, to lead all wings of the 1st Air Force. They won the Flying Safety Award for the months of April, August, October, November and December, and up to the end of January, 1951, had flown more than 10,000 accident-frec aircraft hours.

During the past few months the aircrews of the 89th have participated in three special Air Force missions which involved the air transportation of passengers and cargo over long distances in adverse weather conditions. Reserve crews volunteered for short tours of active duty on very short notice and accomplished these missions in a successful manner. The AFRTC Maintenance section worked day and night to keep the highest aircraft-in-commission status which the installation maintains. The C-46's were preflighted and ready to go at 0730 on each Saturday and Sunday morning, so that the squadron pilots could get the most out of the week-end flying program.

Another example of achievement is the 2236th AFRTC at Standiford Field, Louisville, Kentucky. This Center is composed of



AIR FORCE PREFERENCE—Instructors at Vance AFB, Okla., are unanimous in their approval of the T-28 as a trainer. This ship replaces the old T-6

regularly assigned Air Force officers who are experts in each administrative field. Each of these officers is prepared to lecture, instruct and outline the fundamental program for the training of each unit of the 436th Troop Carrier Wing, which flies the C-47 on its assigned troop carrier missions. The pilots, many of whom a few months ago were single-engine airmen, have been trained to be veteran twin-engine troop carrier pilots.

The week-end training program is set up in three phases. The first phase covers the general education of the Air Force Reservists. The second phase deals with the specialized training in career fields. This education is delivered by lectures and visual aid mediums.

Phase three of the training program is operational and is the duty performance phase. The flight-crew program consists of actual flight missions performed by the Reservists of the Troop Carrier Wing. The pilot and co-pilot receive instruction in formation flying, high-altitude flying and instrument procedures as they may apply to airborne operations. Navigators are given refresher courses in all phases of navigation. Flight engineers receive actual flight operation and on-the-job aircraft maintenance. Radio operators are taught radio procedures to receive and transmit actual in-flight information.

The 1st Air Force also has as one of its functions the procurement of aviation cadets within its area. It has eight teams known as Aviation Cadet Selection Teams which visit leading universities and colleges in the area to explain the Air Force career and pilot-navigator program to college men eligible to apply.

The 1st Air Force as of January, 1951, had the distinction of having the top Aviation Cadet Selection team of all air forces under the Continental Air Command. According to Major Harrison O. Stines, a member of the top team, it has produced more applications for appointment to cadet training than any other team in the country. He reports that interest in the pilot-navigator program has been exceptionally heavy since the Korean situation developed. The team has been making a five-day visit to each college, interviewing and testing applicants, giving aptitude tests and partial physical examinations. This team has been responsible for 40 per cent of the total college men processed for training among the First Air Force's eight teams.

Recently, the 2230th Air Force Reserve Training Center put on the first aviation field day for more than 600 Explorers from the New York metropolitan area at Floyd Bennett Field. The Explorers swarmed over the base (a Naval Air installation) for seven hours, inspecting planes, parachute shops, the flight-control tower and operation rooms, and many of them "flew" Link trainers.

The Air Force-Explorer cooperation program will provide aviation experience for Boy Scouts 14 years and older. There are more than 400,000 Explorers in the U. S. The program will also include airborne operations and aerial combat films. The 1st Air Force program in the N. Y. area will be carried out at six military air installations in New York, Long Island and New Jersey. Reserve Officer Training units at several colleges also are taking part in the program, which will be conducted on a year-round basis.

Red Means Danger

(*Continued from page 19*)

correspondingly low surface tension, could be devised, it would probe deep into surface flaws, seeking out the hidden crevices. And, after the penetrant had reached all the minute inner-metal flaws, all you'd need would be a solution which could "draw out" or "bleed" the red-dyed penetrant to the surface again.

Since what goes in must come out, the red penetrant will show on the surface, exactly outlining the internal flaw. What's more, the red stain on the surface will be proportional to the size, width, and depth of the internal flaw. What you've got is a photograph—and to make it even more vivid, suppose that the "bleeding" agent is white in color. The red penetrant will show up with photographic intensity against the white background.

By observing, you might be saving your neck.

By now about 10 minutes have passed, the penetrant has had time to seek out any flaws in the landing gear, and the guy in the white coveralls takes out another rag, this one with cleaning solvent on it from one of the bottles. He wipes the metal's surface absolutely clean.

When that's dry—and the metal is as clean as when you started—he dabs on the developer, the stuff that "bleeds" or draws the penetrant to the surface. The developer is painted on in a very thin coating and begins to dry almost immediately. Then, as you watch, you begin to see faint traces of a red line etching itself on the developer's white background. So you've got a crack in the landing gear after all!

Within four or five minutes, the red line has spread out and elongated, giving a tell-tale red line—and proving that you missed a crash because you gave science a trial.

So you, the private flyer, breathe a sigh of relief. If there hadn't been a flaw, you'd have known that, too. And all within minutes after that bad landing. No bulky tools were needed, no electricity, just that handy, inexpensive kit that you can carry in your own ship.

The dye penetrant method can detect surface flaws wherever you can reach with a paint brush, dip, or aim a spray gun. This includes pistons, connecting rods, shafts, valves and other metal parts—and all while they're assembled in your engine.

Interpretation of the tell-tale red as it is drawn from the metal flaw isn't difficult. A red line indicates a crack or cold shut; a series of red dots in a line means a tight crack, cold shut, or partially welded lap. Red dots indicate pits or porosity in the metal.

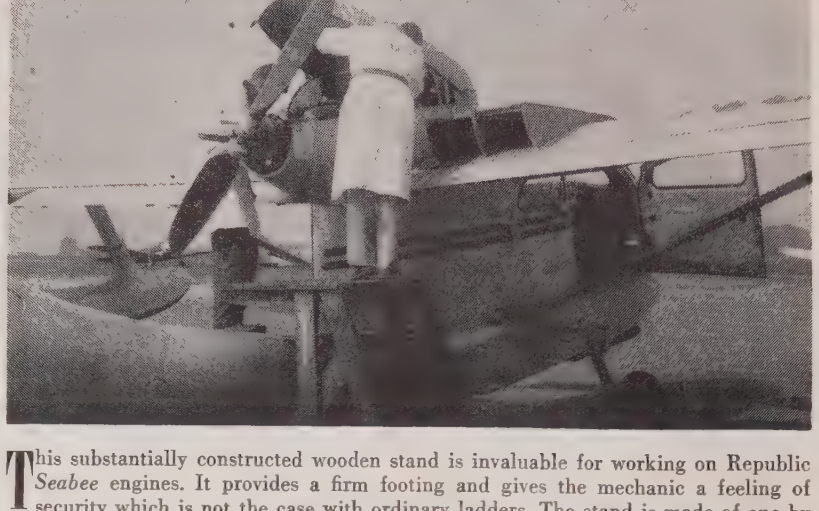
There are some instances where the technique won't work. You'll have to tear out that suspected part to inspect by standard methods. For instance, there has to be some surface manifestation—no matter how hair-thin—for the solution to enter. But a big percentage of your internal structural flaws will show some surface opening. Maybe it'll be invisible to the naked eye and very small, but an opening of some sort is all you need to admit the penetrating detective.

If there's a scratch on a delicate engine part and you think maybe it goes deeper and is a serious flaw, the dye penetrant method will show that up too. For it gives no false indications. If it's only a scratch, no red line will appear. As a preventive maintenance tool the method is revolutionary.

Engineers and aviation experts who've been using the dye penetrant method now for more than 18 months, have taken off the cloak of experimental secrecy and Northrop has set up a subsidiary to make the solutions, called Dy-Chek.

For the private flyer, ever mindful of maintenance bills, red means danger—but it also means an economical, sure and quick method for saving your own life.

WING TIP . . .



This substantially constructed wooden stand is invaluable for working on Republic *Seabee* engines. It provides a firm footing and gives the mechanic a feeling of security which is not the case with ordinary ladders. The stand is made of one by six-inch lumber, yet is lightweight enough to be easily moved by one man. It was made by several of the mechanics at Wings Field, Ambler, Pa., in spare time.

Hot-Rod Helicopter

(*Continued from page 25*)

only $5.00 which compares not too unfavorably with a conventional engine. Actually, the thing will probably operate successfully on Martinis, but our pilots might have trouble with the fumes!"

The main advantage of the ramjet engine is that it puts the power of the helicopter where you want it—at the tip of the rotor blade. Hiller estimates that the end two feet of the rotor blade do as much lifting as all the remainder of the blade put together.

By placing the powerplant at the tip of the blades, the ramjet becomes a relatively efficient engine. This type of powerplant must be traveling at speeds approaching the speed of sound to operate efficiently. At the designed rotor speed of 500 rpm, the engine at the tip of the blades is traveling at 600 feet per second or 450 mph. A small lawn mower gasoline engine with a friction-belt drive is used to start rotation of the blades. As soon as 150 rpm is reached, the ramjets will pick up rapidly under their own power. Though it may take longer, rotor speed may be built up by merely starting the blades by hand.

With the power to drive the rotor installed at the tip of the blade, there is no reason to have a complicated, expensive and heavy gear box or tail rotor drive. There's no torque on this installation and rudder control is obtained from a simple paddle-type rudder inclined 45° off-center at the tail of the ship. There are no rudder pedals and this control surface is turned by merely moving the collective pitch control (the upper and downer) from side to side.

Flight controls are otherwise similar to the conventional Hiller "360." The control stick comes down over the pilot's shoulder directly from the rotor head. Small servo-tabs are linked to the stick and these in turn change the pitch on the main blades. Rate of climb or descent is controlled by the collective pitch stick that is built parallel to the throttle. On the *Hornet*, the throttle is merely a small valve that permits a greater or lesser quantity of fuel to be pumped to the ramjet engines. A simple belt-driven fuel pump is attached to the rotor head and the 37-gallon fuel tank is located on the cg. under the seat.

The Hiller *Hornet* has all the advantages of a twin-engined plane. Should one engine cutout because of a clogged fuel line, the *Hornet* still will have a good glide angle with only one engine operating. Actually, the present model will not maintain altitude with a full load of 900 pounds gross weight should one engine fail, but it does have a very respectable glide angle. According to the designer, should both engines fail or run out of fuel, the ship is very easy to land because the weight of the motors on the tips of the blades will keep them rotating by inertia alone for time enough to misjudge a landing by a hundred feet in altitude. In power-off flight, the blades turn by auto-rotation as long as the ship is held in a rather steep glide. When it is leveled off for a landing, the weight of the tip-mounted engines will keep the blades turning for much longer than a conventional helicopter.

This two-year experimental program was carried on with such secrecy that only a handful of Hiller's own employees knew of the *Hornet* project. An experimental test

stand was built across the landing field from the Hiller factory in Palo Alto and the area was restricted to authorized personnel only. Actually, an old moss-covered farm house shielded the project from inquiring eyes.

It's entirely possible that a number of the "flying saucer" stories from the San Francisco area can be laid directly to Hiller's *Hornet*. Since the ramjets give out a bright blue flame in flight, the ship could easily be mistaken for a "flying saucer." Night flights in the *Hornet* are most spectacular and the flame blazing from the rotor tips looks like a pale blue halo waltzing through the sky. One visitor described the *Hornet* as "an infuriated palm tree that caught fire."

Add the unusual noise of the ramjet to it's weird blue flame and it's easy to see where some of the "men-from-Mars" stories could have begun. The ramjets sound somewhat like a Diesel truck engine with a dull "whoosh-whoosh." The engine is only slightly more noisy than a conventional powerplant.

One motorist driving by the Hiller experimental hangar put his car in the ditch while watching the unconventional ramjet make a take-off.

When you first see this Hiller *Hornet*, you're in for a shock. There's nothing much to it. Facetiously, the cabin model looks like a "Chick Sale" set on three tiny wheels with a big ventilation fan on top. The stripped-down version without a cabin looks too small and fragile to fly at all. The snap-on cabin enclosure is built of Fiberglas and weighs only 20 pounds.

Test pilot Bruce Jones and Stanley Hiller both made demonstration flights. The warming-up process itself is spectacular as flame drips from the rotors after an igniter-spark fires the fuel in the ramjets. As speed picks up, the lawn mower putt-putt is shut off and the ramjets begin to operate at their full power. It's like a 4th of July fireworks display, even to the "woosh" of the aerial rockets.

The simplified instrument panel has only one gage not found on conventionally-powered craft: a fuel-flow meter. Because of the high fuel consumption, the pilot needs an accurate check on his fuel supply. In addition, this large glass meter will fill with air bubbles as the fuel supply becames nearly exhausted.

There are no magnetos to check and no warm-up temperatures to wait for. As soon as the tachometer hits 500 rpm, you're ready to fly.

Up comes the collective rotor-pitch control and the *Hornet* hops into the air. There is absolutely no torque and the jet 'copter handles in the air every bit like a trained ballet dancer. By merely pushing the rudder control to one side, the ship will pivot like Vera Ellen with a flaming halo. It is so smooth and easy that it seems almost unreal.

"This is by far the easiest of any helicopter to fly," says Hiller. "There is no rpm to worry about. We merely set the rotors for a top speed of 500 rpm and leave them alone except to throttle back as the wheels touch the ground."

Accompanied by test pilot Bruce Jones, this *SKYWAYS* writer made a short hop in the new *Hornet*. The ship is surprisingly smooth in the air. As would be expected, because of the inertia of the ramjets there is considerable lag between cutting down on the fuel throttle and any noticeable loss in rpm.

The open model of the *Hornet* makes you feel as though you were flying around strapped to an apple box. There's nothing under you but a very skimpy seat and a little metal plate to use as a foot rest. You can certainly see where you're going!

'COPTER TO FIT A GARAGE—The Hillercopter is small enough to be wheeled into the average garage. Its rotors can be angled to permit Hillercopter's fitting small space

We flew in the *Hornet* on a typical Palo Alto pre-spring day. It was cold, clammy and fog dripped in heavy patches over the factory. But it wasn't cold in the open cockpit. The blast from the fiery ramjets makes the ship quite comfortable in cold weather.

"Actually," said test pilot Bruce Jones, "this ship would have a very practical use as an orchard heater for orange groves. It is probably the most efficient heater in the world and a farmer could cruise back and forth over his grove on a below-freezing night to keep the temperature safe for his fruit trees. The 'copter would add both heat and air circulation.

Performance figures of the Hiller *Hornet* show a top speed of 80 mph with a 70-mph cruising speed. Climb for the first minute is 1100 feet. The ship's 37-gallon fuel tank is sufficient for 40 minutes in the air with the present engines. The estimated ceiling is 12,000 feet with two passengers and 25 pounds of baggage. Since a jet engine becomes increasingly more efficient at higher altitudes, the actual absolute ceiling of the *Hornet* is still something of a mystery.

"The basic thought behind the *Hornet*," said Hiller, "is to bridge the gap between the $12,000 machine and a truly low-cost helicopter that almost anyone could afford to own. We have tried to design an aircraft that would be practically maintenance-free, cheap and easy to fly. The *Hornet* does this by eliminating a $2,500 engine, a $3,000 gearbox and the heavy rotor-drive system that goes with it. Insurance would be very low because of the inexpensive original cost and lack of moving parts.

"We had planned to change engines every 500 hours. Rather than magnaflux and rebuild the used powerplants, our recommendation was to throw them away and pick up a brand new unit for $100 or less. However, that was all geared for regular automotive-type merchandising and mass production.

With an eye to the future, Hiller is keeping a skeleton staff on the *Hornet* project. When asked if more power could be added to the *Hornet*, Hiller nodded. "You can easily place your powerplants in tandem on the end of the blades and use as many as you wish.

And can the ship be sealed-up into a larger commercial passenger-carrying machine?

Stanley Hiller merely nodded with a far-away gleam in his eye.

Target Fascination

(*Continued from page 21*)

and the F-94 fresh off the production line at Van Nuys, California.

"It happened to me, once," he said, "In a P-51. It was a Sunday morning in October, I think, of '44. I was flying number '2' man in a four-ship flight, and we were working over a marshalling yard outside of Hamburg, Germany. We were having quite a time. On the last pass, I was following the leader down from about two or three thousand feet, observing strikes on a locomotive and watching the steam boil up. The next thing I knew, I had run out of air—the train engine was covering the whole windshield. It was like coming out of a fog. I hadn't noticed my speed, altitude, angle of attack, or even where the ground was. Three thousand feet in the dive were completely lost to my memory.

"When I did wake up, I hauled back and pulled out across the top of the train. For a second I was flying through steam and smoke, and when I came out of that, there were several high-tension lines in front of me. I could feel them snapping as I plowed through, but luckily I didn't hit a pole or get any voltage.

"We went straight home after that, and I looked over the ship. The prop and the leading edge of the wings had deep cuts in them from the wires.

"I honestly couldn't understand what had happened. I know I was all right when I went into the dive, and then—blooey. The rest of the flight had pulled up and were yelling at me, and I didn't even hear them."

I asked him what he thought would have happened if it had been a jet he was flying at the time.

"It would have spread kerosene and aluminum and Bob Faulkner all over the marshalling yards. The P-51 comes up easy and fast, and while the jet has a fast recovery too, the big increase in speed and wing-loading naturally means a lot longer pull-out radius. No, I learned my lesson well—in a jet I don't let myself get into a position like that."

Alex Varney, author of the recently published "*Psychology of Flight*," told me this:

"It seems to be a combination of several things, all leading into a state of relative inattention to space and time. One big thing that goes into it is that old bugaboo, over-familiarity. It doesn't happen as frequently to the pilot performing a new maneuver as to the pilot who has perfected his strafing or buzzing to the point of automatic movement and control. This is the flyer who is so 'good' he neglects outside attention in his concentration on that primary objective, the target. From here it is an all-too-easy step into complete fading of awareness. The self-preservative instinct alone, unfortunately, is not always enough to bring the man out of it in time. Even in instinctive reaction, there is a time lag, and at the high speeds of today's flying, any lag is too much."

It can happen to civilian pilots, too.

Bob Cassidy, of Los Angeles and Seattle, has had plenty of hours in the air up and down the coast. But that didn't make him immune. Reported Bob:

"I had landed the Cessna at the Renton, Washington, airport several times, and I thought I knew what I was doing when I lined up for this particular approach. There was no wind to correct for, the air was smooth, pattern empty, and I knew the characteristics of the airplane well.

"Everything indicated an easy landing. I had even picked out the spot on the runway where I wanted to touch down. My glide was correct, airspeed right, the set-up was all that could be asked. From there on I don't know what happened.

"The next thing I knew I hit the runway an awful whack and bounced about 30 feet in the air with the ship hanging on the prop. That shocked me out of my blank spell and I dumped the nose, applied full throttle and recovered okay. Thank Cessna for the ruggedness of their landing gear.

"What went on in my head after I turned onto the approach, I don't know. Everything went blank. I know I was very intent on making a good spot landing but I can give no reason for flying right into that spot on the runway the way I did. Now, when I line up for a landing, I always give myself a mental kick in the pants to keep myself awake."

Glenn Bryan and Norman Willmorth, research psychologists working at present on psycho-motor tests with the University of Southern California's human-centrifuge, took time off from the Aero-Medical lab to discuss target fascination with me. The things that boiled off the top of a three-hour gabfest with these brilliant young scientists were these.

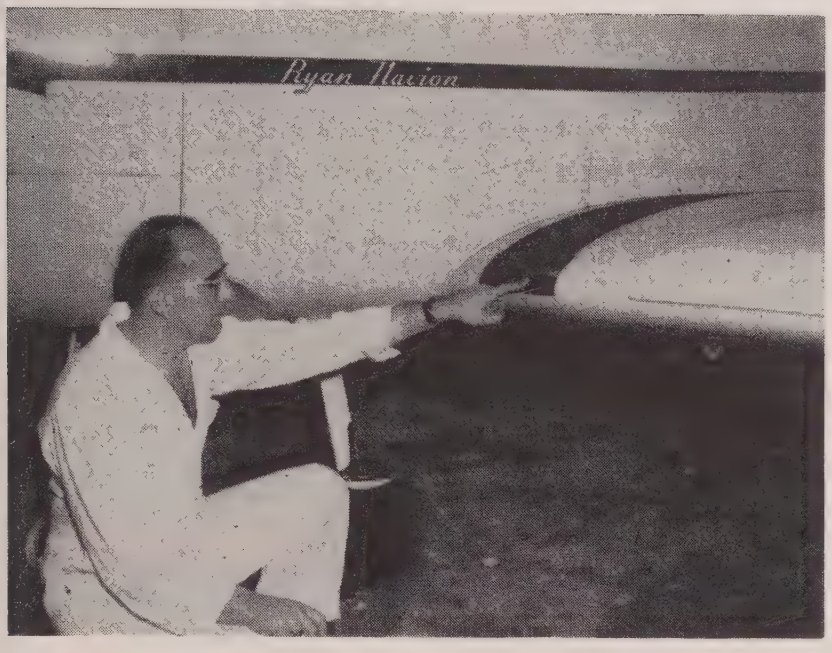
1. The flyer diving on a target does not have the great number of reference points that the man on the ground, driving a car, for instance, has. He does not have fence posts, telephone poles, buildings, white guide lines, and intersections to give him constant reminders of velocity, time, distance, and direction. Instead, everything is laid out beneath him on a giant jumbled checkerboard which he is approaching at a high rate of speed. It is altogether an easily confusing mass of referents.

2. The human has several awarenesses; perception of the visible, the audible, the kinesthetic (deep-muscle movement), and postural (body-position) being ones that bring to the pilot the information necessary for him to make correct judgments. However, it has been proved that when attention has been fixed and focalized in one sensory field, *i.e.*, sight, hearing, etc., the threshold of the others goes way up. If you're reading a good book, do you hear the clock ticking? It's ticking as loud as it is when it keeps you awake at night, but your auditory threshold

Soloed in Two Days

Mrs. Jeanne A. Voltz of Miami, Florida, has proved the ease of flying today's modern airplanes. A writer for a Miami newspaper and the mother of two children, Mrs. Voltz took her first flight lesson one morning, then soloed the airplane, a Piper *Tri-Pacer*, very early the following morning after six hours and 15 minutes of dual instruction. It was the first time she had even been in anything but a transport plane. Her instructor, Bill Strohmeier, reported Mrs. Voltz could have soloed in one day, but high winds in the afternoon prevented that. The *Tri-Pacer* is Piper Aircraft's newest. It carries four people comfortably and has a new tricycle landing gear which makes landings virtually unassisted.

WING TIP...



This "kick plate" riveted to the leading edge of a low-wing monoplane protects that leading edge from scratching and kick damage caused by passengers and pilot stepping on and off the wing. The plate is .030-inch aluminum and is fastened to the wing with seven Cherry rivets. It is painted black to match the wing-walk's protective covering. The man in this photo is Mr. A. Ciano the mechanic who designed and installed this clever means of protection. According to Mr Ciano, the kick plate costs only about $1.25 for both labor and materials to install; the complete job comes to about $2.50, the price Mr. Ciano charges plane owners. Mr. Ciano is vice president of the P & B Flying Service, located at Municipal Airport at Pensacola, Florida. *Bob Blatt*

as gone up because your attention is fixed n the book, so you see and don't hear. ctually, the information *is* being sent—be brain is simply "tuned to another chan-el" and does not accept it until it becomes big" enough to intrude.

3. The flyer who, already in a spatial posi-on that affords few reference points, al-ws himself to become absorbed in one ecific object, may go beyond the point of tellectual control. He may stop thinking out where he is going and how fast he is oing until too late. A man driving a car a highway at night sees a tail-light ahead he "loses himself" watching it until he ashes into the rear of the other car. He comes entranced by his "target" and for-ts about everything else. And a target, itself, gives no warning. Remember this, s vital—judgment is an absolute neces-y in safe flying, and judgment is made by integrating information about *several* mensions. You can't judge by fixing your tention on *one* point.

It has happened to me. It has happened Jerry Williams, Bob Faulkner and Bob assidy. It has also happened to several her pilots I talked to. In every case there ere these three *big* things:

1. Over-familiarity. (It can breed fatal ntempt.)

2. Fixed-attention. (You lose your sense of judgment.)

3. Total concentration. (Nothing is that important.)

Brought down to object-level, they write up any unwary pilot's obituary.

Target fascination is a trap that can happen to any pilot, but there are things any pilot can do to keep out of the trap. First, of course, is recognizing that there *is* such a thing, and if you've read this far, that part is taken care of. The Air Force recognizes it and sets a minimum altitude for all gunnery runs—if a pilot goes lower, he loses his score. Take a hint from that and remember you've got more to lose than a gunnery score.

Don't limit your awareness by fixing your attention on one thing and letting it monopolize your time. You don't have that much time.

Just because you've gotten "good," don't take the whole thing for granted. Forest Lane Rest (Everything In Your Hour of Need) is filled with over-confident pilots.

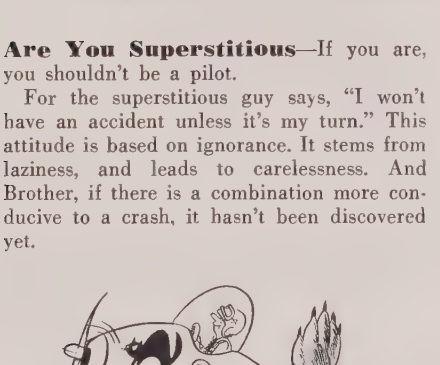
Any pilot who devotes his whole concentration to the idea of "hitting this one on the nose," should have his insurance paid up. Total concentration is synonymous with target fascination. They go hand in hand, foot in grave, so don't *ever* say, "I'll get this —— if it kills me!"

It might.

Dilbert

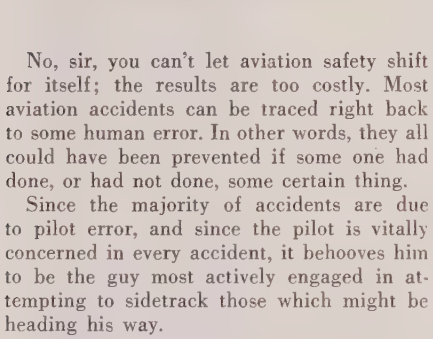
(*Continued from page 33*)

there is a big difference; you can usually get away with being "drunk and disorderly" provided you can prove it was due to sniffing CO instead of imbibing snifters containing C_2H_5OH.



Are You Superstitious—If you are, you shouldn't be a pilot.

For the superstitious guy says, "I won't have an accident unless it's my turn." This attitude is based on ignorance. It stems from laziness, and leads to carelessness. And Brother, if there is a combination more conducive to a crash, it hasn't been discovered yet.

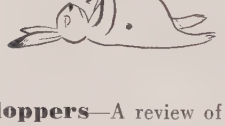


No, sir, you can't let aviation safety shift for itself; the results are too costly. Most aviation accidents can be traced right back to some human error. In other words, they all could have been prevented if some one had done, or had not done, some certain thing.

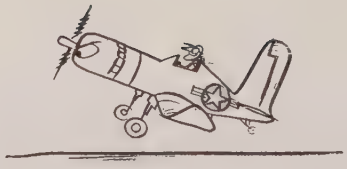
Since the majority of accidents are due to pilot error, and since the pilot is vitally concerned in every accident, it behooves him to be the guy most actively engaged in attempting to sidetrack those which might be heading his way.

The most successful pilot is the one who gives it everything he has. He becomes an expert in each of the many phases of flying. He is intimately familiar with each item of safety equipment, and makes sure that it is always in perfect working order. He analyzes every accident he comes in contact with, to make sure that the same combination of causes will never lay him low. And believe me, he doesn't accomplish all this through "ignorance;" nor yet by "laziness" or "carelessness."

Don't be superstitious, Sonny;
That rabbit's foot didn't save the bunny.

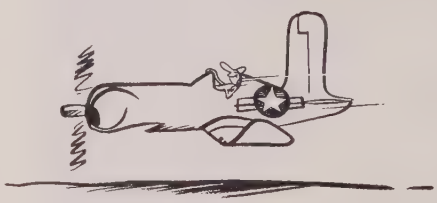


Belly Floppers—A review of wheels-up landing accidents during touch-and-go practice reveals one very significant fact. They



seldom occur the first time around, but rather on subsequent passes. This indicates that pilots tend to get progressively more careless.

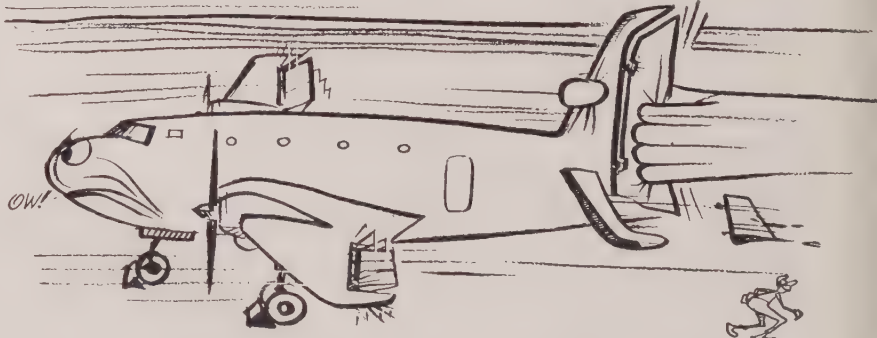
Some training units have sought to prevent wheels-up landings by requiring pilots to leave their wheels down for all bounce drills. This does the trick all right, but experienced pilots claim such training is wrong. They claim it trains the pilots to land without lowering his wheels. This not only causes



more belly floppers, but delays them until a later date when, because of the faster type plane being flown, the same accident is apt to be more dangerous and more expensive.

Certain other training stations have taken action which appears to meet the above objections. It consists of requiring the pilot to handle his landing gear normally on each landing and, in addition, to call the tower when entering the base leg and report. "Turning on base leg, wheels down and locked."

If this signal is not received and acknowledged, or if two-way radio contact cannot be maintained, the pilot is automatically required to make a low approach (not under 500 feet) over the tower. If the landing gear

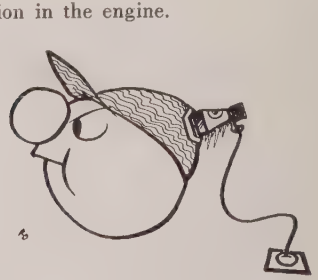


appears to be down and in place, the tower then gives the landing clearance by light signal.

Spark Plug Tip—Noting that an operating unit was installing two gaskets under each spark plug "to prevent seizure," the engine manufacturer warned against such practice. Pertinent parts of this warning are quoted for information and guidance for all and sundry.

"In addition to affording a gas-tight seal between the spark plug shell flange and the cylinder bushing, the copper spark plug gasket has a definite effect on heat characteristics of the plug. Since heat dissipation is

one important function of the copper gask and the heat rating of a spark plug has definite bearing on performance of the plu use of more than one gasket alters he characteristics of the plug and affects i function in the engine.



"Exposing cylinder bushing threads, wh two gaskets are used under spark plugs, conducive to pre-ignition and detonation, ar under the right combination of conditions, dangerous practice. Cylinder bushing threa exposed to combustion, flame and gas in short time will become pitted, corroded an in general, unsatisfactory for installation a spark plug with only one cylinder gasket

Batten, Batten Who's Got the Ba ten—You'd be surprised to learn how ma airplanes are damaged every year due being parked in high or gusty winds, witho being protected by battens. Damage is usual limited to surface controls and actuati mechanisms, but this puts planes out commission, and repairs are expensive. B sides, it's all so unnecessary!

This trouble is not limited to any one ty of airplane. It is more prevalent on lar planes, however, because of the larger contr surfaces they present to the wind, and al because battens are more difficult to insta on large planes.

And don't forget that the prop blast fro other airplanes may do as much damage high winds.

SETH'S SAFETY QUIZ

1. In case of structural or control dama in flight as the result of a failure or collisio what piloting procedure should be followe
2. Does "cruising altitude" mean heig above sea level or above local terrain?
3. What is the minimum angle for crossi a civil airway during instrument flight?

ANSWERS

Climb to safe altitude (at least 5,000 feet) t test out controls, particularly with plane landing condition.
Sea level.
45° to such airway.

Job Opportunities in Aviation

Air Companies Train Engineers

Quickie programs help break industry engineer bottleneck

In newspaper ads in all sections of the country the aircraft industry is literally clamoring for trained engineers of almost every type. The aviation schools such as Spartan, Cal-Aero, Embry-Riddle, etc. are turning them out as rapidly as possible.

To help meet the present critical shortage, however, many of the aircraft companies have initiated "quickie" training programs of their own.

One of the most fruitful of these is found in the activities of Northrop Aeronautical Institute, a division of Northrop Aircraft, Inc. NAI is already proving a valuable aid in helping to break the engineering bottleneck in the aircraft industry.

Besides supplying several hundred qualified young designers to the industry each year through its normal two-year training program, the Institute has developed a 12-week course to provide aeronuatical engineering instruction for graduate mechanical and electrical engineers.

Aircraft engineering departments of several West Coast companies are finding these engineers, once they have been "retreaded" by NAI's intensive aeronautical indoctrination, quite capable in aircraft-design assignments.

Lockheed Aircraft Corporation already has some 2,000 men in its engineering department. Many others are in training, including several qualified in other fields taking the 12-week course at the Northrup Aeronautical Institute, and younger men taking regular courses at Cal Tech and other colleges.

Out on Long Island, N. Y., Republic Aviation has begun its program of converting other types of engineers to aeronautics. Between five and nine weeks of intensive indoctrination is given, depending on the training and previous experience of the individuals concerned.

Among the types of engineers "converted" to date are architectural, civil, electrical and mechanical engineers. Due to the overlapping of skills required in aeronautical engineering, Republic believes that this program may bring practical benefits to its engineering department as a whole.

Piasecki Helicopter Corporation of Morton, Pa. (Philadelphia area) reports that it now has in operation formal classroom training in engineering, including a five-week course in Aeronautical Engineering Familiarization for non-aeronautical engineers, and lecture courses in various engineering specialties.

In addition to this, a job-training program for incoming Junior Engineers has been started. The general objectives of this training program will be to provide orientation for new junior engineers, primarily throughout the production and engineering organization; to emphasize and add to the experience and training of these engineers in production processes peculiar to the helicopter industry; to enlarge the production background of a limited number of currently employed engineers; and to furnish a limited number of well-trained engineers for the manufacturing and inspection divisions.

The program will follow five phases, of which the first three include introduction to the company, its products, shop departments, production control (35 days so far) and 15 days training in the inspection division.

Phase IV will bring the trainee to the Engineering Division, where he will begin by spending 10 days in the Change Order Group, studying drafting room manual, preparation of drawings, engineering order procedures, and material and standard references. This will be followed by periods ranging from 20 to 30 days in each of the engineering groups, such as the rotor group, helicopter aerodynamics group, etc.

After a review of the periodic progress reports and individual discussions held with the trainees, Phase V will complete the training by assignments to a permanent job.

Wright Aero Buys Factory; Will Hire Additional Help

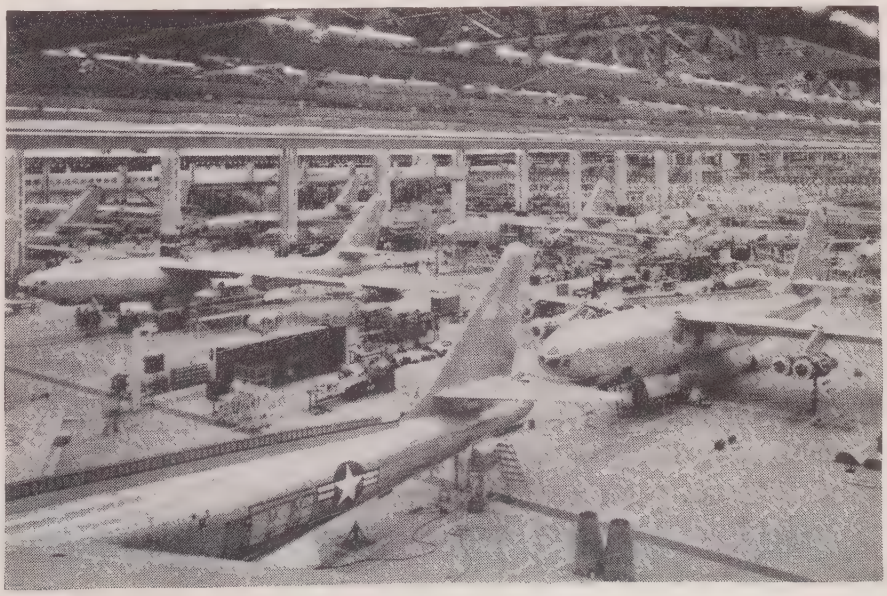
The Wright Aeronautical Corporation, in line with its new controlled expansion program, has purchased the 540,000 square foot facilities of the New Jersey Worsted Mills of Garfield, N. J. The newly purchased property is located a quarter of a mile from Wright's huge Wood-Ridge plant.

Wood-Ridge has a total floor space of 2,290,000 square feet and new construction is under way to provide additional floor space.

The company employs more than 10,000 now, and several thousand more will be employed when production is in full swing.

Consult Kenneth Schmidt, Industrial Relations Mgr. at Wright's Main and Passaic St. ((Wood-Ridge, N. J.) Office, for employment opportunities.

BOEING Airplane Company's Wichita, Kansas Division reflects expanding activity of USAF's B-47 medium jet bomber program. B-47 is being built in quantity for Strategic Air Command



Electronic Engineers Needed by Industry

History is repeating itself in the aircraft industry. The Korean conflict and the threat of that exploding into World War III are causing employment to soar. And, just as prior to World War II, there is a shortage of certain skills.

Some of these skills are relatively new. The advance of electronic research and development, for example, has been so rapid that the supply of engineers and technicians has fallen far behind the demand. The skyrocketing television industry hasn't helped any, either.

The Glenn L. Martin Company has one of the largest staffs of top-flight electronics engineers in the industry (Hughes Aircraft on the West Coast has another). Martin also has one of the most complete manufacturing set-ups in the country for all types of electronic equipment and servo-mechanisms. Yet competent engineers and technicians are in such short supply in these fields that it is almost impossible to keep up with the demands for equipment.

Among developments of Martin Electronics are such things as control systems for guided missiles like the KDM-1 *Plover* target drone; the *Viking* high-altitude research rocket; fire-control systems for turrets, and many other advanced works still classified under military security.

The electronic engineer and technician is the No. 1 employment need of today. This was established in a nationwide survey of professional engineering personnel completed during 1950. Engineers with experience in research and development of radar, television, pulse and display circuit designs are urgently needed.

In the electro-mechanical field experienced engineers in armament, servo-mechanisms, electrical work, rocket propulsion and special weapons or systems design are needed to fill out employment requirements.

Also high on the needed list of employees at Martin are experienced, skilled machine operators on milling machines, turret lathes and drill presses, especially.

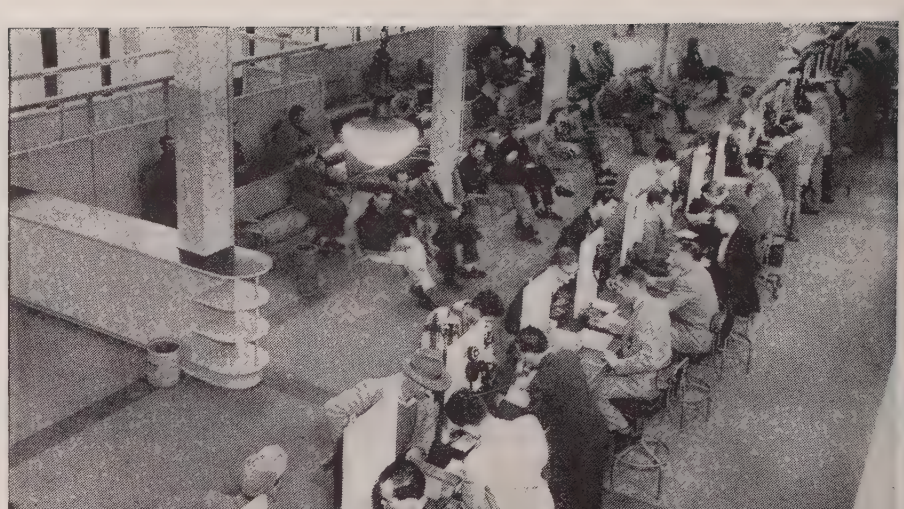
If your skill meets these requirements, contact J. M. Hollyday, Personnel Mgr. at Glenn L. Martin Company, Baltimore, Md.

F-86's to be Built at Columbus Plant

Additional production of the Air Force F-86 *Sabre* will be started soon in the Navy plant operated by North American Aviation, Columbus, Ohio. Both the Air Force and the Navy are using *Sabres*, the Navy's version to be designated FJ-2.

Some months of tooling and preliminary work will be required before deliveries can begin, and during this period there will be a gradual increase in employment.

North American will continue its policy of hiring people from the Columbus area, and of utilizing the services of suppliers in this area to the fullest possible extent. For further employment information, consult James Swanson at NAA's office, 4300 East Fifth Avenue, Columbus 16, Ohio.



INCREASED ORDERS for military aircraft has brought unlimited employment opportunities. Employment offices, such as Boeing's in Seattle, Washington, are busy signing workers

Aeroproducts Expansion to Increase Co. Employment

A 100 per cent expansion of the Aeroproducts Division of General Motors in Dayton, Ohio has been announced. This expansion has become necessary to fill Air Force requirements for propellers for the Fairchild C-119C, and Navy requirements for turbine propellers for use on the Douglas A2D attack plane, and Consolidated Vultee R3Y flying boat freighter.

Employment during peak propeller production at Aeroproducts is expected to reach about 4,000. At the present time the figure is about 1600.

The immediate requirements are for skilled employees, such as graduate engineers, tool designers, product designers, draftsmen, tool makers and skilled machine operators. For employment possibilities, consult John C. Ballantyne, P. O. Box 1047, Municipal Airport, Dayton 1, Ohio.

F-89 Order is Upped

Northrop Aircraft, Inc. has received a letter of intent from the U. S. Air Force for a substantial additional number of *Scorpion* F-89 all-weather interceptors.

This new order has created immediate job openings for a variety of skilled production workers, including assemblers, sheet metal workers, machinists and tooling men, according to D. C. Stadler, the company's personnel manager at 1001 E. Broadway, Hawthorne, California.

Pratt & Whitney Opens New Training School

P & W Aircraft Divison has opened a new school in Hartford as part of the Training Department's expanding program to meet the educational needs of the company's accelerated production schedules. It is located in the Taylor & Fenn Building, 54 Arch Street.

The four-story building accommodates between 600 and 800 trainees at one time. Each trainee will attend the school for a minimum of two weeks, specializing in the work to which he will be assigned in the East Hartford plant. When full enrollment has been attained, the school will operate on three shifts.

During World War II P & W conducted training courses for more than 27,000 of its employees. About one-half of this number were machine tool operators.

At the peak of these operations, almost 12,000 women were employed on their machines. In June, 1950, BK (before Korea), only 967 women were employed. By late winter it was close to 2,500, with the number steadily increasing.

New USAF Contracts Foretell New Job Opportunities

A speed-up in production of Lockheed F-94 all-weather jet fighters has been ordered by the Air Force. This speed-up plus increased orders for the airplane assure continued production of F-94's well into 1952.

*

Avco Manufacturing Corporation has received a letter contract from USAF calling for production of Wright engines under license from Wright Aeronautical. The engines will be produced at the former Chance Vought plant at Stratford, Conn.

*

The Kaiser-Frazer Corporation has contracted with the Air Force for the manufacture of an undisclosed number of Wright R-1300 engines. The engines will be built at the K-F Detroit plant. Mr. T. A. Bedford, general manager of the K-F Engine Div., estimates that another 4,000 employees will be required for the Wright engine job.

*

Serious housing shortage in San Diego area is complicating manufacturers' efforts to get skilled labor.

HANGAR FLYING

Aero Commander Orders

Word from R. T. Amis, Jr., president of Aero Design and Engineering Company, announces the company is beginning to take orders for the new Aero *Commander*, twin-engine executive-type airplane now in production at the company's Tulakes Airport factory. Materials are on hand for the construction of 20 Model 520 *Commanders*, and orders will be given priority as received. Price quoted is $45,000 for Model 520 equipped with 260-hp Lycoming engines, Hartzell constant-speed full-feathering props, basic radio which includes Lear VHF transmitter, receiver, Lear ADF, and a complete flight panel of instruments. Deliveries are expected to be made in September and October.

Texas Bullet

Aircraft Manufacturing Company's four-place all-metal *Bullet* is in production at Tyler, Texas. Powered by Continental E-185 engine developing 205 hp at 2600 rpm (take-off), the *Bullet* cruises at 190 mph at 5,000 feet, has a landing speed of about 60 mph and a range of 750 miles. Equipment includes two-way radio, primary blind flying instruments, and navigation and landing lights.

Attention: Pilots

Don Witt, of Chicago, passes on to readers the following sign which hangs in the flight office of the Harlem Airpart, Oak Lawn, Ill.:

"PILOTS are men who start out knowing a great deal about very little, and go on learning more and more about less and less until they know everything about nothing.

"RADIOMEN start out knowing very little about a great deal and go on learning less and less about more and more until they know nothing about everything.

"WEATHERMEN start out knowing everything about everything, but end up knowing nothing about anything due to their association with pilots and radiomen."

Tower Light Target

The CAA has developed a paper target for use by technicians in checking the accuracy of light guns used in airport traffic control towers to direct traffic. Light guns must be carefully, continuously and with great accuracy sighted on one plane—the plane requesting the signal. If the gun is accurately focused and the sights are correct, only that plane will see the red, green or white light. Focusing and sighting a light gun requires technical skill, and certain definite procedures must be followed. The new target devised by the CAA consists of a cross within a shaded circle eight inches in diameter, and it can be set up in most towers, thus making it easier for maintenance technicians to service the light guns and keep them operating with accuracy.

RECORD was set by Charles Blair, Jr. in *Mustang*. N. Y. to London: 7 hours 48 mins.

	Complete Aircraft			Manufacturer's Net Billing Price		
	Shipments			Shipments		
	TOTAL Jan-Nov	November	October	TOTAL Jan-Nov	November	October
				(thousands of dollars)		
Aeronca						
Champion 85 hp	22	--	--			
Champion 90 hp	70	1	3			
Superchief	8	--	--	374	14	19
Sedan	49	3	4			
7FC	1	--	--			
7CCM[a]	8	1	--			
Beech						
Bonanza	413	39	32	5,670	759	474
D-18	25	6	2			
Cessna						
140A	280	10	19			
170A	561	53	55	4,769	426	486
190	42	2	5			
195	110	16	15			
Emigh-Trojan - Trojan	14	1	N.A.	38	3	N.A.
Engineering & Research						
G	20	2	2	66	7	7
Luscombe - 8-F	22	1	9	61	2	25
Mooney - M-18	43	3	N.A.	76	6	N.A.
Piper						
Cub Special	3	--	--			
Vagabond	1	--	--			
Clipper	11	--	--			
Tandem Trainer	415	44	10	2,980	N.A.	150
Pacer	555	12	13			
Stinson	73	--	--			
L-18C[a]	68	12	32			
Ryan - Navion	221	18	10	2,284	199	109
Taylorcraft						
Sportsman	21	1	1	45	2	2
Texas Engineering						
Swift	21	3	1	92	10	4
T-35[a]	1	--	--			
TOTAL	3,141[b]	228	213	16,876[b]	1,428	1,276

a/ Military type aircraft sold to other than U.S. Military Customers. b/ Includes shipments of 5 Cruisairs and 47 Cruisemasters valued at $391,000 by Bellanca, and 6 Call Airs valued at $30,000. N.A. Not available

NOVEMBER report of AIA shows shipment of 228 planes by 11 companies in November

Flying Farmer Repair Service

A movement is underway between Oklahoma A & M and Flying Farmer officials to make the municipal airport at Stillwater the maintenance and repair center of the Flying Farmer organization. Maintenance will include 100-hour inspections, annual inspections, overhaul and routine checks.

Hangar Talk

TRANS WORLD AIRLINES has announced the appointment of Kenneth Fletcher as Public Relations Manager to replace W. E. Boughton who has been named Assistant Director of Public Relations. Ken Fletcher was formerly Public Relations Manager in San Francisco, but his new assignment transfers him to New York City.

CIVIL AERONAUTICS ADMINISTRATION reports it has openings for 70 Aircraft Communicators and 30 Maintenance Technicians in Alaska. CAA Alaskan yearly salaries begin at $3,875, and the men selected to fill these openings will be in line for higher grade jobs paying up to $5,750 per year.

J. R. GRAY CO., INC., of Dallas, Texas, reports Miss Delphine Bohn has joined the organization. Miss Bohn is a multi-engine pilot, and has specialized since 1944 in flying and selling both the Twin Beech and the *Bonanza* to business executives.

★ CLASSIFIED ADVERTISING ★

SKYWAY'S CLASSIFIED ADVERTISING RATES ARE 15¢ PER WORD—FIRST 15 WORDS (MINIMUM SIZE) $2.00

USED PLANES WANTED

POWERS & GEORGE, Aircraft Brokers, of 475 Fifth Avenue, New York City; and, 505 North Ervay, Dallas, Texas, have purchasers for all types of aircraft. No charge for listing your ship for sale. Write for details, describing your airplane.

USED PLANES FOR SALE

FOR SALE AND ALSO WANTED—Used Aircraft; free listing. Lenard Aircraft, 505 Fifth Avenue, New York.

AERONCA

FOR SALE 1947 AERONCA Super Chief. Guaranteed not over 100 hr. Always hangared. Privately owned, two-way radio. Like new. Wally Roth, Wauseon, Ohio.

SEDANS: 7 available. 1948, #1460HS, has 249 hours. 161 hour engine. Metal propeller. Radio. Hangared. Undamaged. $2250. Inquire, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

BEECHCRAFT

BONANZAS: 10 from $6500. 1948, A-35 #698BS, has 225 hours. Gyros. VHF radio. Omnirange. ADF. Relicensed August. Hangared. Undamaged. $10,000. Apply, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

TWINS: 18 available. C-18S Executive, #2888S, has 690 hours since overhaul, engines zero time. Nose tank. Gyros. Excellent radio. ADF. Two spare overhauled engines and propellers. Relicensed September. Exceptional condition. $25,000. Consult POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

BELLANCA

CRUISMASTER: 1950, #6955S, has 500 hours. 190HP engine. Aeromatic. Auxiliary tank. Gyros. VHF. Omni-range. Relicensed. $7600. Cost $12,000. Inquire, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

CESSNA

TWINS: 12 available. #545S has 547 hours, 12 hours since aircraft and engines overhauled. Recovered and relicensed July 1950. Gyros. Radio. All bulletins. Bargain. $1500. Apply, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

DOUGLAS

DC-3 TYPES: 8 available. Cargo, passenger, and executive interiors. For details consult POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

ERCOUPE

ERCOUPES: 14 available. 1948, #98885S, has 94 hours. Landing lights. Radio. New. Bargain. $1600. Inquire, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

GRUMMAN

GOOSE AMPHIBIANS: 3 from $27,000. #63204S has 90 hours since rebuilt. New engines. Repainted 1950. Executive interior. Blind instruments. Automatic pilot. ADF. New. $33,500. Apply, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

GRUMMAN MALLARD, total time 1200 hrs., Left Eng. 179 hrs., Right 445 Hrs. Spares go with airplane. Call Detroit, Logan 3-1400.

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accepted with the understanding that it will be placed in the first issue closing after receipt of order. Classified forms close first of second month preceding date of issue.

All Classified Advertising Prepaid

LOCKHEED

LODESTARS: 8 from $15,000. Plush 11 passenger Executive, #60101S, has 975 hours, 6 since overhaul. Icebox, bar, buffet, lavatory. Zero engines and propellers. Airline instruments and radio. Beautiful ship. Top condition. $60,000. Consult POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

LUSCOMBE

85'S AND 90'S: 7 available. 1947, 85HP, #2847KS, has 170 hours. Float fittings. Corrosion proofed. Skis. Primary blind. Radio. Never on floats. September license. Bargain. $1500. Also; June 1948, 90HP, #1249BS, with 87 hours. Metal propeller. Primary blind. Radio. New. Bargain. $2400. Inquire, POWERS & GEORGE, Aircraft Brokers, 475 Fifth Avenue, New York City; or, 505 North Ervay, Dallas, Texas.

NAVION

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Commercial Ticket

(*Continued from page 27*)

include wind drift, radius of action, off course and maybe even double drift problems.

In meteorology you should be familiar with air masses and fronts, forms of precipitation and condensation and a multitude of strange sounding terms like convection, advection and radiation.

Civil air regulations must be memorized and there are more of them than you had to learn for your private license.

Aircraft and engine theory questions will have to be memorized unless you are a pretty good mechanic yourself. If you're not, memorize the strange sounding names like aspect ratio, magneto, dihedral and venturi and then visit your airport mechanic and have him point them out to you. It's usually easier to remember things that you see than just words on a printed page.

You should pass your class two physical before you make any serious plans to spend a lot of time and money preparing for a commercial ticket. Then if you are, unfortunately, that one in a thousand who can't pass the physical you'll know it at once.

You can study for the written tests while practicing the commercial flight maneuvers and the written may be taken at any time before the flight test. The five written test parts are considered separately and if you fail one part, only that one has to be repeated—not the whole test.

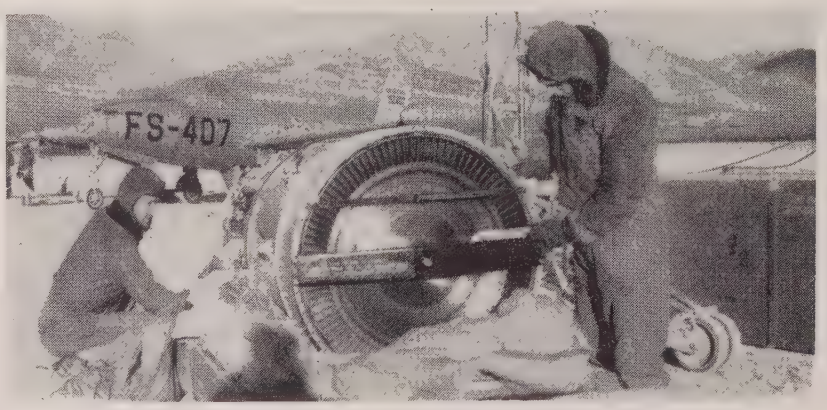
A CAA commercial examiner cannot ride with you for a flight test until you have passed both written and physical exams and hold a written recommendation from a rated flight instructor.

Here are a few hints which may be of some help to you in passing a commercial flight test:

Spot Landings—Practice these under all types of wind conditions. You will have to fly a far different pattern with a 30-mph wind than you will with only a 10-mph wind blowing. The higher the wind, the smaller the pattern is a good rule to remember. You won't be allowed to slip on all your spot landings, but there is no rule against varying the glide angle. If you're a little high during an approach, try pulling the nose up just a little. If you're too low, dive the plane slightly. Contrary to much public opinion, diving the plane will cause it to float further nearer the ground; pulling the nose up will cause the plane to settle faster and land shorter. Don't overuse this trick, however, but use it, if you must, to stretch or shorten a glide.

Chandelles—These are nothing but steep climbing turns; you will be asked to demonstrate one with and one without power. Just remember never to start the roll-out recovery until you have completed 90° of your turn. You should complete a chandelle 180° away from the starting position with the plane approaching a stalled attitude.

Lazy Eights—If you have an enemy, take him up while you practice this maneuver; it's the best way I know to make him airsick. Lazy eights are performed into the wind, the same as pylon eights are, but only one reference point is used. The nose and wing are flown through that point with the nose of the plane following the pattern of a figure eight set up on its side. Be sure that the nose travels the same distance above and below the horizon in this maneuver.



KEEP 'EM FLYIN'—In Korea Sgts C. Byro *(left)* of Kingston, Okla., and W. Beam of Staunton, Va., uncrate a new jet engine for fighter installation

Spins—Don't stall the plane too high or it may spiral instead of spin. Use the NACA recovery which is simply—opposite rudder, stick forward and neutralize rudder. Be certain to make clearing turns, fairly steep 90° turns in both directions, before starting any acrobatic maneuvers.

Simulated Forced Landing— Keep your eyes open and your reflexes ready for this one at all times during the flight test. The examiner usually is tricky and likes to catch you off guard. The throttle may be pulled back during eights on pylons or when you're flying a rectangle course. Keep a field and the wind direction in mind at all times and when the throttle comes back, head for the field, make all your turns at as high an altitude as possible, and then come in high and slip. Don't make any wild gyrations close to the ground and don't become excited. Usually, the examiner will take care of the throttle and clearing out of the engine.

There are other flight maneuvers required during a flight test and these include stalls with and without power, spins to various headings—one, one and a half, two, two and a half and three turns. Seven hundred and twenty degree power turns are also required. You will have to demonstrate a constant banked spiral, flight around a rectangular course and eights on pylons.

On all these maneuvers your examiner will be looking for smooth flying and good judgment. He will expect a great deal more precision than was required on a private flight test.

Some of these maneuvers were included on your private test, others will be demonstrated by your flight instructor. He won't recommend you until you're really proficient.

Remember to provide a chute for your flight test and have a full tank of gas and clean windshield on the plane you are to use. Taxi slowly, make S turns and by all means use chocks when you start the engine. This is good practice at any time, and it shows the examiner that you are a careful and thoughtful pilot.

Now you know a little about the maneuvers in which you will be expected to show proficiency during your commercial flight check. You know, too, how to make a good impression on your flight examiner. Let me remind you *again* to be sure and pass a commercial physical exam and written test before you come up for your flight check. Also be sure to have $10 ready to pay to the examiner. This is the legal fee to which he is entitled for running your flight test and preparing the multitude of paper work that must be taken care of.

But most important of all, don't forget to practice your flight maneuvers and get an instructor to ride with you regularly to check your progress. Let your gal friend's ride go until after you have that commercial ticket.

If you want to carry people for money
Let the other guy fly all the honeys.

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Flying With The New Avigator

Latest model of Mitchell unit provides complete radio setup for private pilots

Having flown in *Bonanzas* for flight demonstrations of the ARC, NARCO and Lear navigation and communication equipment, I was glad of the opportunity to see how the Mitchell *Avigator* operates in a Ryan *Navion*. For this deal (arranged by Don Mitchell), the owner-pilot was Hardwick "Wicks" Stires of the investment firm of Scudder, Stevens & Clark. He has flown the *Ercoupe*, Cessna 140, *Bonanza* and other personal aircraft for several years.

We met at Roosevelt Field, Long Island, on a recent Saturday afternoon. Before take-off, I was given a quick run-over of such externals as the antennae for transmitter, receivers, omni, directional loop, etc. I settled into the co-pilot's seat (with Stires' 10-year-old nephew Roger as a back-seat passenger) and we ran over the main features of the *Avigator* and other instruments.

Radio Panel ▶ The *Avigator* was at the left, with its compact 6½ inch x 5 inch dial face (*see photo, center*), with the 3-inch omnirange magnetic bearing indicator just above it (*photo, right*). The General Electric 1B *Flightfone* LF transceiver, which up to recently has been standard equipment in the *Navion*, was at the right. Stires said he intends to supplant this with the very useful Lear ADF-12 *Orienter*.

The Mitchell *Avigator* is a complete low-cost lightweight radio installation specially designed for personal aircraft. It includes a six-channel VHF transmitter (switch at upper left, standard channels provided for Range and Tower, with the 122.8 mc private pilots' Unicom crystal to be added shortly); tuneable VHF receiver (left-hand dial, outer circle); LF range band receiver (outer circle of right-hand dial); LF standard broadcast receiver (inner circle, with switch above for Beam or B'Cast, and tuning knob lower right); directional loop, with azimuth indicator (inner half circle on left-hand dial, loop control at lower left, switch for Loop or Antenna top right center); 75 mc marker beacon receiver (switch between the dials); VHF omnirange receiver (tuning knob lower center). Volume controls are at top center, inner knob for VHF and outer knob for LF.

The total weight of transmitter-receiver, omni indicator and power supply is 22 pounds installed. Being the same size as the earlier *Motorola* LF model (also engineered by Don Mitchell), installation of the new VHF *Avigator* with Omni in older LF-equipped planes is greatly simplified.

Test Flight ▶ It was sunny but hazy on the horizon as we took off from Roosevelt Field. Leveling off at 2,000 feet, we tuned the VHF to 115.5 mc to pick up Caldwell-Wright VOR. Stires explained a special feature of the *Avigator* VHF tuner which he has found to be a great convenience and time saver. A very high knob-to-band ratio is desirable in tuning a VHF receiver in rough air, but if this ratio is retained constantly too much time may be lost in scanning or sweeping the dial from one channel to another. Therefore, a small button is provided in the center of the VHF tuner (*see photo*), and by depressing this button the high ratio is released and the dial scale can be quickly swept through the entire spectrum, the loudest VOR picked out when you're not sure of the required frequency. Upon releasing the button, the knob restores itself to the high ratio at the new position.

Within about 30 seconds we began to hear the "beep-beep" of the Caldwell omni, and the yellow needle omni bearing indicator moved around to 90°, the bearing of our plane *from* Caldwell. Stires then rotated the parallel lubber lines so that the open end straddled the needle; its apex pointed to 270°, our course *to* Caldwell VOR station, or due west. As we had been heading south, we changed course until the Kollsman magnetic compass heading showed 270°. All we had to do then was to fly this course, keeping the indicator needle centered within the parallel lubber lines, with drift and magnetic compass errors automatically compensated. The red neon light on the indicator dial (just above the figure 18 on the dial—*see photo*) was shining, showing that the omni signal was reliable, as of course it should be at only 40 miles, and at 2500 feet.

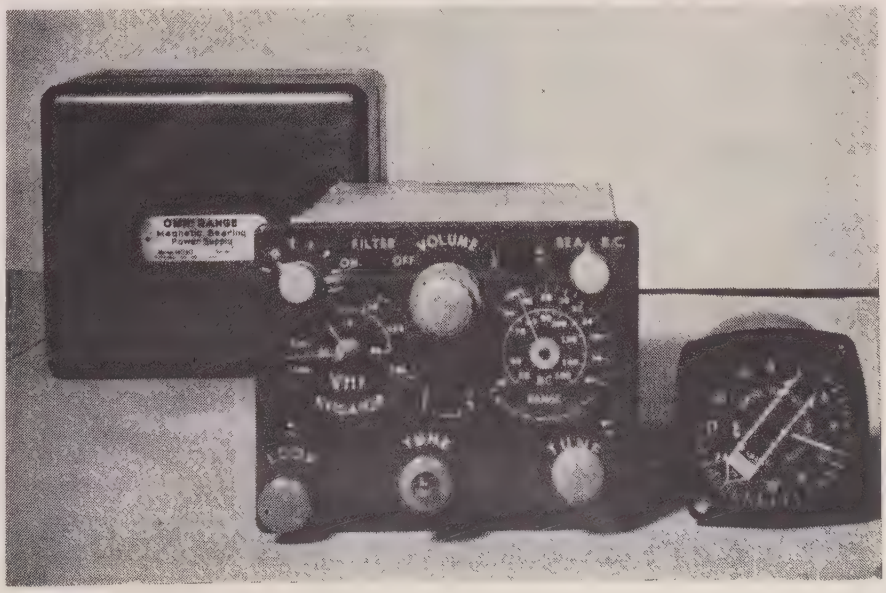
This procedure differs from the conventional omni operation (Collins, Bendix, ARC, NARCO, etc.) involving a tuning switch, Left-Right pointer needle, bearing indicator and To-From indicator. As Stires put it, the *Avigator* omni functions more like a VHF-ADF (automatic direction finder).

We gave Caldwell a position report, and asked for a check on their reception of our message. "We get you loud and clear," came the response through the Bendix *Flightweight* speaker overhead, clear and as distinct as FM radio.

I wondered how it would sound on LF, so we tuned the *Avigator* to La-Guardia Tower, now a few miles behind

(*Continued on page 64*)

ALL-WEATHER omnirange navigation for every plane owner is available in the Mitchell *Avigator*, providing seven radios in one. Cost: $635, with loop, marker beacon extras



OPG Report Details All-Weather System

The nearly one-inch thick report of the Operational Policy Group (or SWG #5—Special Working Group) of the Air Coordinating Committee's Air Traffic Control & Navigational Panel promises to be the most important document ever compiled on air navigation and traffic control.

This report, entitled *"Air Traffic Control and the National Security,"* is the operational blueprint for implementing the RTCA SC-31 report. This was the technical blueprint for the common system (*i.e.,* military-civil) of the new U. S. electronic airways, of which the transition program is now well under way.

The report was hammered out in 10 months of hard work on the part of NAV panel's OPG, comprised of top-level technical and operational people of both government and industry. The Chairman was Cmdr. A. W. Wuerker of the Coast Guard; Vice-Chairman, S. P. Saint, ATA; Secretary, L. W. Burton, ACC Staff.

All-Weather System ▶ The report contains a detailed and comprehensive description of a practical and up-to-date air traffic control system for the United States—a system which is flexible and capable of expansion to at least double our present capacity, a system which will permit operations under virtually all-weather conditions, a system which is based primarily on electronic equipment. The Technical Division of ACC has already accepted the report, and implementation of some of its features is already under way.

The great bulk of required equipment will be ground equipment, with airborne equipment kept to a minimum. This means that the private pilot will get a break, and with a minimum investment can share the system designed to meet all types of civil as well as defense requirements.

The major portion of air traffic in the U S. moves either to, from or between 17 principal terminal areas. These areas are the bottlenecks. The OPG made three major policy recommendations in regard to the terminal-area problem:

Highlights ▶ (1) Radar should become the primary traffic control facility in congested terminal areas. All procedures, traffic patterns, control displays should be designed to supplement the radar and to serve the radar controller. Normally aircraft would be required to have two-way radio communications, omnirange and marker beacon receivers to facilitate radar control and as a safety measure.

(2) More air-ground voice communication must be provided.

(3) In areas of critical density the radar approach and departure procedures should be usable 24 hours a da on the same basis, regardless of weather

Radar Safety Beacon ▶ Due to its majo recommendations regarding the use o radar, the OPG closely scrutinized th limitations of present-day radar, an the NAV panel has already requeste the Air Navigation Development Boar (ANDB has responsibility for develop ing all equipment required for the com mon system) to develop on a top prior ity basis a simple radar safety beacon fo aircraft control purposes.

This airborne transponder would pic up a radio pulse signal, amplify it an return a coded signal very similar t the wartime IFF (identification, frien or foe). It is expected to be inexpensiv when produced in quantity (tens o thousands will be required), and wil insure radar coverage during such con ditions as sleet, snow and thunderstorm

The transponder will also reinforc the echo from aircraft with poor re flective surfaces—a feature particularl important to operations of high-spee jet aircraft, single-engine four-plac executive type and smaller personal air craft. Finally, the ASB (air safety bea con) provides rapid aircraft identifica tion information which is of the utmos importance to the air traffic controlle in addition to substantially extendin the range of the radar coverage.

Reducing Noise in VHF Radio Receivers

Safer flying can result from bette radio reception in personal planes, an techniques for improving receptio quality now are known, according to study made for the CAA by Electroni Research, Inc. of Evansville, Ind. Th results of the study are contained i Technical Development Report No. 11 entitled *The Development of Tech niques for the Utilization of VH Radio in Light Aircraft.*

Intensive tests were carried out o nine makes of personal planes, includ ing the Piper *Cruiser,* Stinson *Voyager* Ryan *Navion,* Beechcraft *Bonanza, E coupe,* Luscombe, Swift, Bellanca an Cessna 140. As a result of these test the CAA reports that most complet noise suppression in the VHF receive now coming into general use for pe sonal aircraft (such as the ARC NARCO, Lear and Mitchell) is obtaine with a properly maintained, shielde ignition system.

The study also revealed that the u of resistance spark plugs without shiel ed harness provides an economical, bu not as good a means of reducing ign tion noises. The tests also showed th location of the VHF receiver and th length of the antenna transmission lin are not critical in the small plane, an that spark plugs are the worst offende

n producing disturbing noises. It was ound that the best location for the V-ype antenna on most small planes was ver the forward part of the cabin.

Appendix I of the 80-page report consists of a *VHF Radio Installation manual for VHF Omnirange Radio Installation and Noise Reduction Techniques.* To make the results of the study widely available for practical application, CAA has issued this manual in the form of a 4-page leaflet headed *Reduce Noise in VHF Radio Receivers.* Copies may be had from the Office of Aviation Information, CAA, T-4, Washington 25, D. C.

One Picture Worth a Dozen Needles!

According to CAA's recently completed Research Report 92, aircraft instruments which give a pictorial display enable pilots, both skilled and unskilled, to navigate better than those which give a symbolic display.

Most airplane instruments today are of the symbolic type. That is, with needles and pointers they indicate to the pilot that he is on or off his course or altitude, or that his equipment is operating normally or abnormally. To interpret these indications, he must translate these "signs" into usable knowledge, such as which way to turn to get on proper course. In the pictorial-style instrument little or no interpretation is required, and proper corrective action usually is automatic.

Using a newly developed Pictorial Computer, an instrument which constantly shows the aircraft's present position in positive relation to the destination, the range station and compass course on a "picture," 15 private pilots and 15 pilots with instrument ratings flew 407 navigation problems without a single unsuccessful solution. The same pilots, using instruments that gave a symbolic display only, flew 439 similar navigation problems, of which 50 were not successfully solved within the time allotted.

The problems were all connected with flying on the Very High Frequency omni-directional radio range (VOR). The pilots "flew" in a Link trainer in which the usual symbolic instruments (needles and pointers) and a specially-made pictorial instrument were installed.

The Pictorial Computer showed the omni-station at the center, north at the top and the airplane as a pip (like a radar pip on an oscilloscope) which moved about the station in accordance with the airplane's simulated movements. The symbolic display consisted of a deviation (right-left) meter, a bearing selector, and a TO-FROM meter, which are more or less standard in present omnirange receiving equipment.

Four problems were given each pilot. In one, with the aircraft already oriented and on course, he was to fly the VOR station and depart from it on another course. In the second, with his position unknown, the pilot was to orient himself and fly directly to the station. The third was similar to the second, but a specified course for flying to the station was designated, and in the fourth he was to by-pass the station according to the procedure for use with omnirange.

Using the Pictorial Computer, every pilot made every turn correctly the first time. With the symbolic display, unnecessary turns were made, all turns were slower and pilots showed no rapid improvement after practice.

The pictorial instrument was made especially for these tests, and in its present form would not be practicable for installation in planes. However, the CAA, as part of its "housekeeping" work for the Air Navigation Development Board, has let three contracts for development of pictorial computers which will give the pilot a pictorial display of aircraft position.

A portable lightweight model which can be held in the pilot's lap when in use is expected to cost about $500, and the prototype is now being flight tested.

A panel model has been produced by Sperry, designed for permanent mounting in the instrument panel. Its frontal area is a little larger than that of the portable model. For airline use a more expensive and slightly heavier and deeper console model with automatic map selection will be available.

Standard Oil (Calif.) Offers New Flight Log

Here is a boon for cross-country pilots. Standard Oil of California's pocket-size celluloid Standard Flight Guide is being distributed as a courtesy gift through Standard dealers. A bit longer than a post card, the Guide has spaces for all the information a pilot requires on a long flight, and the notations can be washed off at the completion of the trip.

On the front of the card are spaces for plane number, pilot's name, address, departure point, destination, estimated time en route and fuel. A flight log has space for check points, compass headings, time, and range and tower frequencies. There are also spaces for winds-aloft velocity and direction by altitudes up to 10,000 feet. A graphic explanation of weather sequence and symbols completes this side of the Guide.

The reverse side gives pilots the VHF frequencies for range, towers and emergencies; distances at altitudes that VHF can carry; airway altitudes; radiotelegraph code; and traffic control light signals. One edge is marked off for mileage on world charts, the other is marked for sectional charts to cover 50 miles.

Avigator Flight Report

(Continued from page 61)

us. The message was intelligible, though there was some clatter due to static. Switching to the GE set, it was 90 per cent clatter, 10 per cent voice.

We headed south down the harbor, and after a few minutes tuned to Allentown VOR (117.4 mc), about 65 miles away; we were still at about 2500 feet. It took nearly a minute to get this, requiring the headphone at first. The signal came in all right, but no red light. This indicated that it was not 100 per cent reliable; another few miles, or maybe 500 feet more altitude and the light would come on.

"How unreliable would it be?" I wanted to know.

"Oh, maybe 5° or so. Let's see." The needle was showing 95° *from* Allentown (or 275° *to*). We were just about over the tip of Coney Island. Putting one end of his plastic mileage rule on the chart at Allentown VOR, and connecting with the tip of Coney Island (just over 65 miles on the rule), Stires pointed out that the compass rose around the Allentown omni on the chart showed a bearing or slightly more than 100°, instead of the 95° shown by the omni indicator.

To wind up the omni angle, I asked what happened on the *Avigator* set when passing over a VOR station. Stires replied with a smile, "It doesn't leave you in any doubt! When the ship crosses one edge of the cone, the needle quivers and takes a complete swing around the dial. Then over the other edge it takes another 360° swing and finally settles 180° from its former position. Rotate the lubber lines to align with the new position, and there you are. Your indication is now *from* the station that you were just heading *to*."

We then turned eastward over Long Island and I asked about the Direction Finder loop, as I had heard that this operation was sometimes a bit tricky on the lower priced lightweight sets. Stires switched from Antenna to Loop, and I suggested that we tune in on WHLI, Hempstead (1100 kc). Within a few seconds we were listening to a crooner. Stires then rotated the loop (by turning the knob) until the song faded out. This was the "null" position. The white half of the needle (*see photo*) showed that the bearing of WHLI was between 85° and 90°. To illustrate homing on the station we turned the nose of the *Navion* until the azimuth indicator pointed to 0° and 180° (this "ambiguity" is inherent in the simple D-F operation; you can't be sure at first whether you are heading toward the station or away from it).

We turned our nose to the east again, and I asked how the marker beacon signal came through on this set. The nearest one was at Babylon, on the S/E approach to Mitchel AFB. Stires switched to ON, and within a few minutes we heard a clear, high-pitched continuous dash signal coming through.

"OK, our chart shows us a bearing of 300° to Mitchel, and that it is just eight miles to the end of the NW/SE runway. We'll take that course and maintain 120 mph Indicated. Look at your watch, and within four minutes we should hit it on the nose."

And that's just about what we did, except at the last minute we veered over to Roosevelt, circled once, made our approach and landed. The *Navion,* by the way, performed very nicely in every way throughout the flight.

As for the *Avigator,* I didn't need to have "Wicks" Stires tell me that Don Mitchell has packed into it practically everything that the private pilot would need, radio-wise, from *Cubs* to Cessna 195's. About 500 of the new sets are now in actual operation, including many in company aircraft. The best part of it is, Mitchell claims to have all the materials he needs at his plant in Mineral Wells, Texas, to turn them out for the next couple of years at least.

Dual Radio Compass Indicator for ADF

Two new CAA type-certificated dual radio compass indicators have been placed on the market by Aviation Accessories, Inc. of Fort Worth, Texas.

The model ADF-50 (CAA TC 4R4-2) is a 5-inch dual indicator unit designed especially for red and green ADF receivers, such as the modified war surplus R5-ARN/7, also handled by Aviation Accessories, Inc. ($325). The fluorescent dial features a red and green pointer and all cardinal points of the azimuth scale are marked with large, easy to read fluorescent markers. A rotatable azimuth scale is incorporated in the unit and is adjustable by a small knob located in the lower right-hand corner of the indicator case. The knob is marked 'VAR. (variation) E—W', and is used to correct the azimuth scale of the indicator to either the magnetic or true scale desired by the user.

Aviation Accessories model ADF-52 (CAA TC 4R4-4) is a smaller version of the ADF-50. It is a standard 2⅞ inch dial size unit and does not incorporate the rotatable azimuth scale. Both models sell for $225 f.o.b. Fort Worth. The ADF-50 Indicator weighs only 30 ounces. The Aviation Accessories R5-ARN/7 Radio Compass Receiver unit weighs 48.13 pounds. (For a brief description of the Automatic Direction Finding operation see February SKYWAYS. *Navicom* section, page 64).

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2 Good Reasons Why Owning a Plane is Practical

Not so long ago a low-cost plane lacked enough performance and carrying capacity to be practical, and high-performance aircraft with real utility were too expensive. With the four-passenger Pacer, Piper changed that picture; and it is now practical for many firms and farmers to own a plane.

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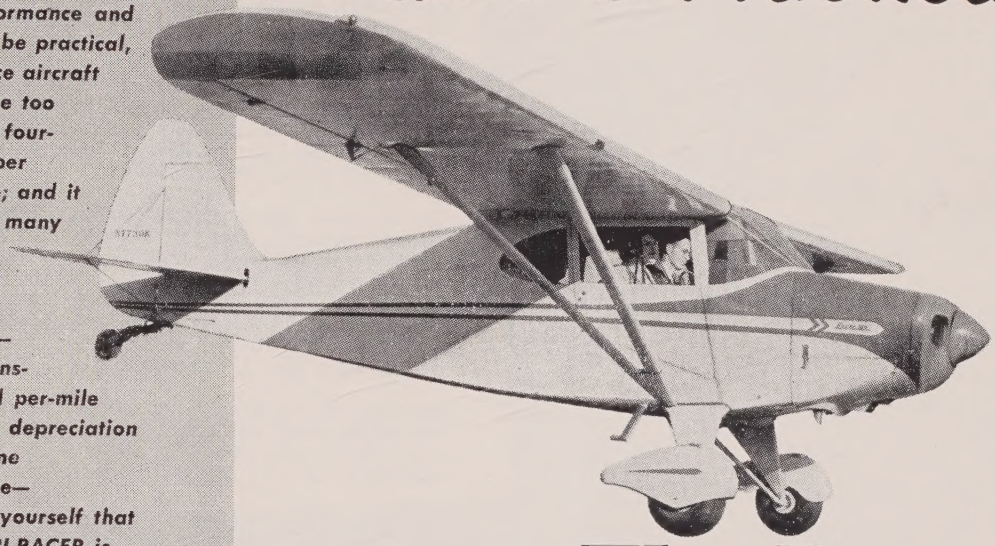
Then see how fast the PACER will get you from where you are to where you want to go—and you'll be doubly sure it's Piper for you. Better than 120 mile-an-hour speed at 16 miles to the gallon in a machine that doesn't cost more than a fine car means really appreciable savings in time and money. Let your nearest Piper dealer show you the "2 good reasons" this week.



The Pacer

The Tri-Pacer

Two fine new four-passenger Pacers for 1951. The PA-20 PACER, with regular gear, which cruises 125 to 134 miles per hour and sets the pace for maximum efficiency and economy of flying. The PA-22 TRI-PACER, with the tricycle landing gear, which brings you new flying ease with steerable nose wheel for easy ground-handling, and inter-connected rudder and ailerons for in-flight simplicity.

Both Pacers feature the new, exclusive Duraclad nonflammable finish, sleek new styling with added streamlining, and that solid big-airplane feel which makes the Pacer far more comfortable than other types. Cabin appointments mean added comfort—hot or cold temperature control, ash trays, glove compartments, adjustable front seat, separate front and rear doors, and added soundproofing for quiet flight. *For colorful brochure write Piper Aircraft Corp., Lock Haven, Pennsylvania, Dept. K-4*

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August 5, 1950
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LEAR, Inc.
Grand Rapids, Michigan

Gentlemen:

The LEARAVIAN has been a most satisfying investment. It has proven useful in many unexpected ways. In addition to supplying local and airways weather reports, I find that when planning transcontinental trips it is practical to listen to approach control and airliners en route (on the Marine band) from Honolulu to Chicago, thereby getting a fairly clear picture of conditions over a three thousand mile radius. This performance is all the more remarkable to me in that it operates on the built-in antenna, although my home is in a deep canyon in the Hollywood Hills, where reception is normally very difficult. The reception has proven completely dependable, either on external power or batteries.

The battery re-charging feature has eliminated the "dead battery" bugaboo that seemed always to occur when a set was most urgently needed. My business use of the BONANZA frequently takes me off Airways where the rural phone service is rather slow. The LEARAVIAN provides me with the certainty of latest reports from the range stations that are so essential to safe and proper use of business aircraft.

The Broadcast band provides a large range of stations carrying news and entertainment that is most welcome, especially in remote locations where many other radios fail to provide reliable reception.

My heartiest congratulations on a superb engineering achievement.

Sincerely,

Vance Breese

/s/ Vance Breese

MEET VANCE BREESE

famed aviation engineer and test pilot extraordinary. Mr. Breese served as consultant on design and flight test problems for Bell, Brewster, Curtiss, Douglas, Fairchild, Lockheed, North American, Northrop, Vultee, and other companies with whom he contributed to the development of many hundreds of airplanes. He conducted the first flights of the Mustang, Northrop Wing, Black Widow, Mitchell B-25 Bomber and many others.

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